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The Symplocaceae of Japan

Hidetoshi NAGAMASU

ABSTRACT A taxonomic revision of the family Symplocaceae (*Symplocos* Jacq. only) in Japan is provided. Throughout a broad survey of herbarium specimens and living plants in the field, pollen grains, inflorescences, and fruits are found to be major source of taxonomic character. Twenty-three species are recognized in Japan, one species (*S. sonoharae*) being assigned to subgen. *Symplocos*, and 22 species to subgen. *Hopea* (L.) Clarke. The species of subgen. *Hopea* are further classified into eight sections. Keys, distribution maps and complete synonymy with full description for all species are provided. Six new taxa are described and two new names are proposed: sect. *Glaucae, sect. nov.*; sect. *Lancifoliae, sect. nov.*; sect. *Okinawenses, sect. nov.*; *S. sonoharae* var. *oblonga, var. nov.* (from China); *S. liukiuensis* var. *iriomotensis, var. nov.*; *S. prunifolia* var. *tawadae, var. nov.*; *S. kuroki, nom. nov.*; *S. sawafutagi, nom. et stat. nov.* The first chromosome counts of three Japanese species are also presented: 2n = ca. 90 in *S. sonoharae*; n = 11 in *S. stellaris*; 2n = 22 in *S. tanakae*.

KEY WORDS Symplocaceae/ *Symplocos*/ Japan/ taxonomy

CONTENTS

Introduction

The family Symplocaceae Desfontaines consists of a single genus *Symplocos* Jacq., with about 400 species of shrubs or trees. It is widespread in moist tropical and subtropical regions, but is not distributed in Africa, western Asia, and Europe. This family is often placed in the Ebenales as a close ally of Styracaceae (*e.g.*, Cronquist, 1981), although its ordinal position is not yet established (see Nooteboom, 1975: 3–4).

Symplocos is a morphologically diverse, and taxonomically difficult genus. It is often hard to find good diagnostic characters for species. The poverty of collected specimens is also one of the reasons for such difficulties. Often only a few specimens are known for some species, because many species occur only in the higher elevations or on small islands in

the tropical and/or subtropical regions. Probably many sister species have been formed by isolation, causing the taxonomic difficulties.

Such taxonomic difficulties are reflected in the recent revisional works. Nooteboom (1975) revised the Symplocaceae of the Old World, but his species concept was extremely wide. Some species contain many infraspecific taxa: for example, *S. cochinchinensis* (Lour.) Moore comprises 4 subspecies, 29 varieties and one topodeme, and *S. macrophylla* Wall. *ex* DC. 6 subspecies and 13 varieties. Some species have no infraspecific taxa, because of their broader limits. Concerning *Symplocos* of Taiwan, Nooteboom (1975) accepted 6 species, while Ying (1975) distinguished 31 species in total. Thereafter, the species of Taiwan were revised by Nooteboom (1978) to be counted 14 species, and by Ying (1987) to be counted 21 species. As regards the species of *Symplocos* of China including Taiwan, Nooteboom (1975) recognized 33 species, but Wu (1987) reported 77 species.

Concerning the species of *Symplocos* in Japan, Nooteboom accepted 10 species, which made a marked contrast to 21 species recognized by Murata (1989). In their treatments, four deciduous species recognized by Murata are reduced by Nooteboom to *S. paniculata* (Murray) Miq.; likewise, and *Symplocos nakaharae* (Matsumura) Masamune, *S. lucida* Sieb. & Zucc. and *S. tanakae* Matsumura are merged into *S. lucida*.

When Nooteboom (1975) reduced many deciduous taxa to a single species *S. paniculata*, he commented that "although typical drought forms occur, there usually is neither any correlation between ecology and hairiness or leaf shape, nor between geography and these varying characters". In this paper, not only full descriptions but also distribution maps for all distinct species are presented to show correlations between geography and morphological characters.

Consequently, I recognize here 23 species of *Symplocos* in Japan. Five new taxa (3 new sections and 2 new varieties, addingly one new variety from China) are described and two new names are proposed.

Materials and Methods

Specimens preserved in the herbaria, A, BK, BKF, BM, BO, E, K, KAG, KANA, KUN, KYO, L, MAK, MATSU, P, PE, RYU, SHIN, SING, TAI, TI, TNS, TOFO, TUS, UC, W, and the Herbarium of Shizuoka University, Japan, were examined. Field studies were made in various localities in Japan.

Preparations of acetolyzed pollen grains mounted in silicon oil were used for the mesurements of pollen size (see Nagamasu (1989a) for voucher specimens and further information).

For observations of somatic chromosomes, root tips from cultivated plants were used. After pretreatment in 0.002 M aqueous solution of 8-hydroxyquinoline for 4 hr at 18–20°C, the root tips were fixed in 45% acetic acid, then macerated with 1 N HCl for 1 min at 60°C, stained with 1% aceto-orcein, and squashed. For meiotic preparations, flower buds were fixed in acetic alcohol (1:3), and the anthers were stained in 1% aceto-carmin after mordanting in 1% iron alum for 30 min. Voucher specimens and localities are listed in Table 1 (see p. 183).

Gross Morphology

Habit. Shrubs or Trees. Most species are evergreen except for the species of sect. *Palura*.

Twigs slender to rather thick, terete, ridged or winged, glabrous to densely hairy, terminated by a scaly bud. Hairs simple, 1-celled.

In some species the ridges of twigs are well developed and look almost like wings (*e.g.*, *S. kawakamii*). Usually a twig is covered by one kind of hair, but in some species two kinds kinds of hairs are observed. For example, twigs of *S. lancifolia* are densely short villose and sparsely pilose. The density of hairs is usually varied within species, but characters of hairs are often taxonomically of use. In some species, the twigs are always glabrous.

Leaves simple, bilateral and exstipulate, spirally or distichously arranged, rarely pseudoverticillate; margin usually glandular-serrate or glandular-crenate, often more or less recurved; midrib impressed or prominent on upper surface; nerves pinnate.

In Japanese species, only spiral phyllotaxis is observed. Whether the midrib is prominent on upper surface or impressed is a taxonomically important feature. In Japanese species, the prominent midrib is distributed in sects. *Lancifoliae*, *Palaeosymplocos* and *Okinawenses*. In the latter two sections, all species have prominent midribs.

Inflorescence axillary and/or situated on branches without a subtending leaf, rarely terminal; determinate; racemose (botryoid), spicate (stachyoid) or paniculate, simple or compound. Flowers with a bract and 2 bracteoles at the base of flower except for terminal flower; terminal flower with 2–4(–many) scales on the stalk, the scales spirally arranged. Bracts and bracteoles often keeled, caducous or persistent.

The inflorescence of *Symplocos* is morphologically a botryoid, a stachyoid, or a panicle, because the axis is terminated by a flower. In some species with elongate inflorescences such as *S. prunifolia* or *S. cochinchinensis*, however, the terminal flower is sometimes not developed well and may drop before flowering. The inflorescence is often branched at the base, forming a double botryoid (branched raceme, Fig. 1a) or a double stachyoid (branched spike, Fig. 1d). The terminal inflorescence is characteristic of the sect. *Palura* comprising deciduous species. All other evergreen species have axillary inflorescences.

Axillary Inflorescences. The simple and/or double raceme with persistent bracts (Fig. 1a & b) is observed in *S. sonoharae* (subgen. *Symplocos*) and *S. okinawensis* (subgen. *Hopea*). But, these two species do not seem to be so closely related to each other, because other morphological characters, such as pollen, corolla, stamens or fruits are different.

The racemose inflorescence with caducous bracts (Fig. 1c) is distributed in sect. *Lodhra*. The branched form (double botryoid with caducous bracts) is not observed in Japanese species. The inflorescence of *S. myrtacea* is loosely 3–6-flowered and its terminal flower has a long stalk. On the other hand, that of *S. prunifolia* is densely 10–30-flowered and the terminal flower is short stalked or often not developed.

Fig. 1d–f represent spicate (stachyoid) inflorescences. *S. cochinchinensis* and its allies (sect. *Bobu*) are characterized by elongate spikes branched near the base (double stachyoid, Fig. 1d). Its reduced form, the simple elongate spike (Fig. 1e), is observed in *S. lancifolia* and its allies (sect. *Lancifoliae*).

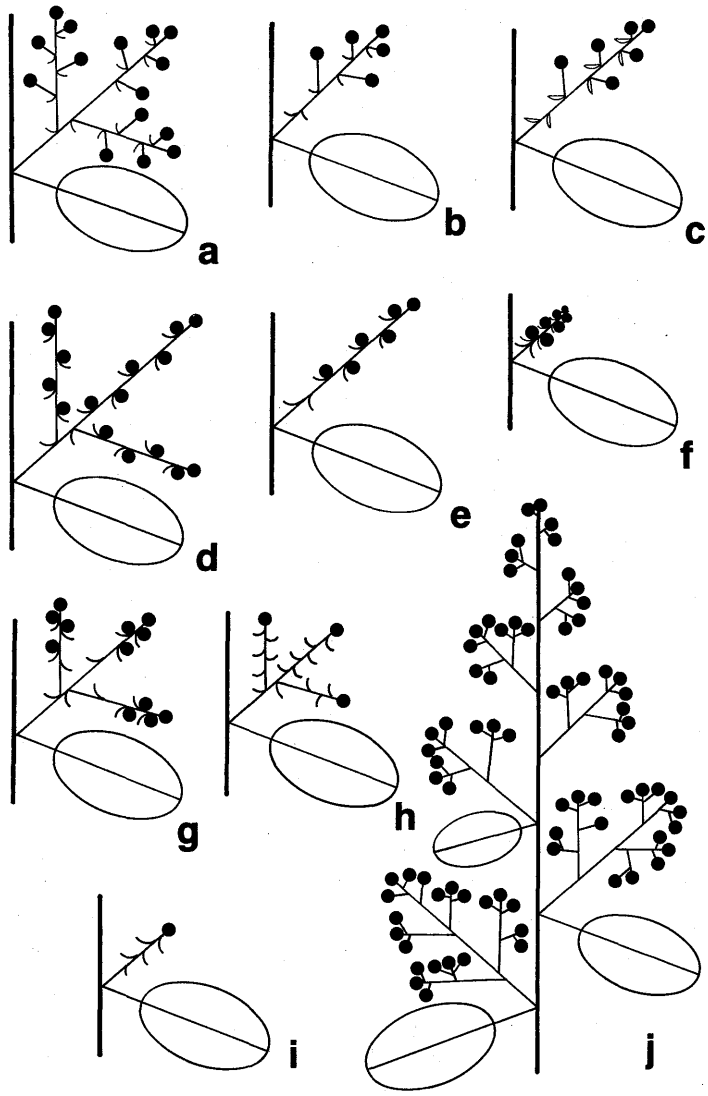


Fig. 1. Diagrammatic representation of inflorescence types in Japanese *Symplocos*. — a: axillary raceme branched at base (double botryoid), bracts persistent (in *S. okinawensis*). — b: axillary raceme (botryoid), bracts persistent (in *S. sonoharae* and *S. okinawensis*). — c: axillary raceme (botryoid), bracts caducous (in *S. caudata, S. liukiuensis, S. myrtacea* and *S. prunifolia*). — d: axillary spikes branched at base (double stachyoid), bracts persistent (in *S. cochinchinensis, S. konishii* and *S. theophrastifolia*). — e: axillary spike (stachyoid) with persistent bracts (in *S. lancifolia* and *S. microcalyx*). — f: axillary condensed spike (stachyoid), bracts persistent (in *S. glauca* and *S. stellaris*). — g: axillary condensed spikes branched at base (double stachyoid), the lower flowers often reduced, bracts persistent (in *S. kawakamii, S. kuroki, S. nakaharae* and *S. tanakae*). — h: axillary condensed spikes branched at base (double stachyoid), flowers reduced except terminal one, bracts persistent (in *S. boninensis*). — i: axillary condensed spike (stachyoid), flowers reduced except terminal one, bracts persistent (in *S. pergracilis*). — j: terminal panicle, bracts caducous, partly reduced (in sect. *Palura*). Bracts omitted in fig. 1j.

The spicate inflorescence condensed in a head-like cluster (Fig. 1f) is of *S. glauca* and *S. stellaris* (in Japanese species). In *S. glauca*, however, the inflorescence often elongates after anthesis.

In sect. *Palaeosymplocos*, the inflorescence is specialized in another way (Fig. 1g–i): the inflorescence tends to be condensed, and the lower bracts are often sterile. Fig. 1g shows rather loose inflorescence in *S. nakaharae* and *S. kawakamii*. Its further condensed form is observed in *S. kuroki* and *S. tanakae*. In *S. boninensis*, all flowers are reduced except for the terminal one, and the condensed inflorescence axis is densely covered by the sterile bracts (Fig. 1h). The extreme form of this line is represented in *S. pergracilis* (Fig. 1i): the inflorescence is uniflowered, but many scales are observed on the condensed axis as a trace of the sterile bracts.

Terminal Inflorescences. The terminal panicle (Fig. 1j) is characteristic of all deciduous species of sect. *Palura*. The inflorescence of this section is much specialized: the branches are irregularly concaulescent and/or recaulescent; bracts and bracteoles are principally caducous and linear, but often reduced; the structure of a branch of the panicle is basically similar to the double raceme as in Fig. 1a. This type may be derived from the axillary double raceme (Fig. 1a) by the reduction of subtending leaves in the upper part of the shoot.

The lower branches of the panicle are subtended by foliage leaves; consequently the panicle contains a few foliage leaves. In *S. coreana*, however, the foliage leaves rarely occur in the panicle, because only the lowest branch is usually subtended by a foliage leaf.

Flowers. Flowers are actinomorphic, bisexual or plants rarely polygamous.

Calyx. Calyx tube adnate to the inferior or semi-inferior ovary; calyx limb (free part of calyx) divided into (3–)5 lobes (Fig. 2); calyx lobes more or less equal, imbricate or valvate, connate at base.

The calyx is glabrous or hairy depending on species, but in *S. coreana* and *S. sawafutagi*, both glabrous and hairy calyx tube is observed within a species. In some species, only calyx limb or lobes are hairy but calyx tube is glabrous. The indument, shape, size of calyx are taxonomically good characters.

Corolla shallowly to deeply (3–)5(–11)-lobed, white, often tinged pink, yellow, or violet, lobes imbricate, glabrous or hairy, sometimes ciliate.

Characters of corolla has been regarded important to divide the genus into subgenera

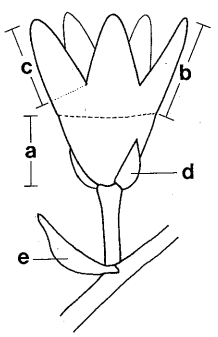


Fig. 2. a: length of calyx tube; b: length of calyx limb; c: length of calyx lobe; d: bracteole; e: bract. (Corolla removed).

(Brand, 1901; Nooteboom, 1975). In subgen. *Symplocos*, the long corolla tube is formed. In subgenera *Hopea* and *Microsymplocos*, the corolla is deeply divided nearly to the base, and the tube is very short.

Stamens 4 to many, inserted on the corolla, monadelphous, pentadelphous or free; filaments flattened or cylindrical, glabrous or hairy, rarely papillose.

This character also has been regarded as very important for the infrageneric classification (Bentham & Hooker, 1876; Brand, 1901; Nooteboom, 1975). In subgen. *Symplocos*, the stamens are monadelphous, forming a rather long staminal tube. The filaments are more or less flattened and the apex is abruptly narrowed forming a short whip below the anther. In subgen. *Microsymplocos*, the stamens are monadelphous but the tube is very short; the free part is gradually narrowed to the base. In subgen. *Hopea*, the stamens are variously pentadelphous, or connate only at the base; the staminal group are alternipetalous.

Disk. Nectary disk surrounding the base of single slender style; globose, cylindrical, 5-glandular, pulvinate or flat; glabrous or hairy.

As *S. sonoharae* (subgen. *Symplocos*) has a semi-inferior ovary, its disk-like protuberance includes the upper part of ovary.

The shape and/or indument of the disk are rather constant character within a species. But, in *S. coreana* and *S. sawafutagi*, both hairy and glabrous disk are observed within a species, and plants with hairy calyx tube tend to have hairy disk.

Ovary inferior or semi-inferior, 2- to 5-locular, but septa not always complete at the uppermost part; ovules 2–4 in each locule.

In Japanese species, the ovary is 2 or 3-locular. The 2-locular ovary is observed in *S. sonoharae* (subgen. *Symplocos*) and 6 species of subgen. *Hopea*: *S. coreana, S. sawafutagi, S. paniculata, S. tanakana, S. kuroki* and *S. nakaharae*. As the 3-locular ovary is widely distributed in subgen. *Hopea*, the 2-locular is considered a derived character.

The number of ovules in each locule is always 4 in Japanese species.

Fruit a monopyrenous drupe, globose, ellipsoidal, ovoid, obovoid, ampulliform or cylindrical (Fig. 3); calyx lobes persistent, forming an acute or blunt beak, or a crown; outer part of mesocarp fleshy, blue, dark blue or black when ripe.

Stone globose, ellipsoidal, ovoid, obovoid, ampulliform, cylindrical or trigonous; surface smooth or longitudinally grooved; inner part of mesocarp corky or woody.

The locules of ovary recognized in anthesis are not always developed in fruits. Fig. 4 shows the transverse sections of stone of several representative species in Japan. In some species all locules are developed (Fig. 4a–d), but in others only one locule is developed (Fig. 4e–k). The development of mesocarp is also various but constant within a species. In *S. tanakae* (Fig. 4b), the mesocarp is well developed forming a thick stone wall, on the other hand, in *S. myrtacea* (Fig. 4k) or in *S. coreana*, the mesocarp is very thin. These characters of stone are important to recognize species groups.

Seed and embryo. Seed usually solitary in each developed locule, straight or curved; seed coat very thin, surface often striate. Embryo embedded in copicous endosperm, and similarly curved with the seed.

Since Bentham & Hooker (1876), the shape of seed has been regarded as an important character in recognizing infrageneric taxa. Fig. 4 shows the shapes of seed and embryo.

Straight to slightly curved seeds are presented in Fig. 4a–g. In species whose fruit wall is hard and well developed, the seeds tend to be straight, probably because the septa are not destroyed by the development of seed. But, in *S. tanakae* (Fig. 4b) and *S. kuroki* (Fig. 4c), seeds often longitudinally curved without destroying septa. Fig. 4h–k shows the curved seeds. In this case the septa are destroyed. In *S. lancifolia* (Fig. 4h), the seed develops and destroys the septa, and becomes obliquely laterally curved. In *S. cochinchinensis* (Fig. 4i), the seed is similar to that of *S. lancifolia*, but it is twice curved in two planes, at first longitudinally and then laterally, because the stone is ampulliform. On the other hand, in *S. sawafutagi* (Fig. 4j) or *S. myrtacea* (Fig. 4k), the seed longitudinally curved.

As noted by Nooteboom (1975), the shape of the seed seems to be correlated with the shape of the fruit: globose and ampulliform fruits mostly have curved seeds, cylindrical fruits

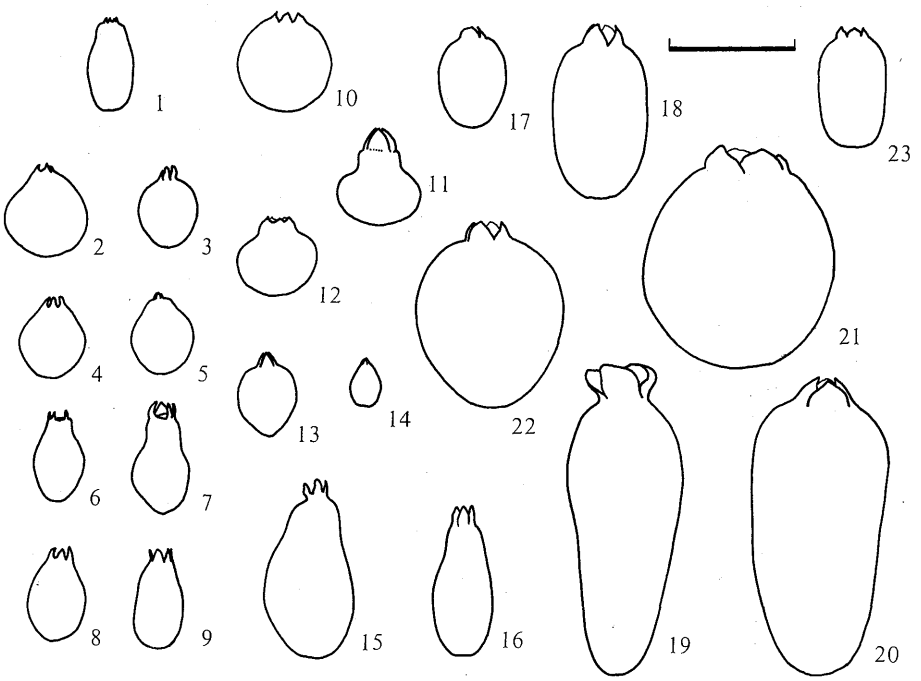


Fig. 3. Fruits in outline. 1: *S. sonoharae* var. *sonoharae* (*M. Tamura et al. 47*, KYO). 2: *S. coreana* (*N. Kurosaki 14752*, KYO). 3: *S. sawafutagi* (*N. Fukuoka 10507*, KYO). 4: *S. paniculata* (*G. Murata 20884*, KYO). 5: *S. tanakana* (*Z. Tashiro s.n., 9 Sept. 1937*, KYO). 6: *S. myrtacea* (*Z. Tashiro s.n., 31 Aug. 1935*, KYO). 7: *S. liukiuensis* var. *liukiuensis* (*H. Ohba 12*, KYO). 8: *S. caudata* (*G. Koidzumi s.n., 25–31 July 1923*, KYO). 9: *S. prunifolia* var. *prunifolia* (*N. Kurosaki 8084*, KYO). 10: *S. konishii* (*H. Nagamasu*, cult. Kyoto Univ.). 11: *S. cochinchinensis* (*H. Nagamasu 1131*, KYO). 12: *S. theophrastifolia* (*K. Tsuchiya et al. 6*, KYO). 13: *S. lancifolia* (*H. Migo s.n., 10 Nov. 1954*, KYO). 14: *S. microcalyx* (*H. Nagamasu & M.N. Tamura 2111*, KYO). 15: *S. glauca* (*E. Kinoshita 1096*, KYO). 16: *S. stellaris* (*T. Shimizu 86-255*, KYO). 17: *S. nakaharae* (*Y. Miyagi 9173*, KYO). 18: *S. kuroki* (*Z. Tashiro s.n., 25 Aug. 1924*, KYO). 19: *S. pergracilis* (*G. Murata et al. 258*, KYO). 20: *S. boninensis* (*G. Murata et al. 646*, KYO). 21: *S. tanakae* (*G. Koidzumi s.n., Sept. 1921*, KYO). 22: *S. kawakamii* (*G. Murata et al. 110*, KYO). 23: *S. okinawensis* (*G. Koidzumi s.n., 27–31 May 1923*, KYO). bar = 1 cm.

straight seeds, and ovoid and ellipsoid fruits straight or curved seeds.

Seedling epigeal, phanerocotylar; primary root distinct and slender, persistent root-hairs not observed; hypocotyle erect, terete, glabrous but often densely papillose; cotyledons 2, opposite, linear, slightly thick, obtuse at apex, subsessile and connate to each other at base; eophylls spirally arranged without cataphylls.

The radicle emerges from the apical pore of the stone. The number of the apical pores is correlated with that of the develped locules. In Japanese species, the radicle usually emerges in autumn of the second year, and the cotyledons appear in spring of the third year (Yamanaka, 1975; Yamanaka et al., 1992). Yanagida (1938: no. 532, t. 531, ut '*S. zentaroana* Makino', *nomen*) reported that in *S. tanakae*, three seedlings in total emerged from each apical pore of the stone.

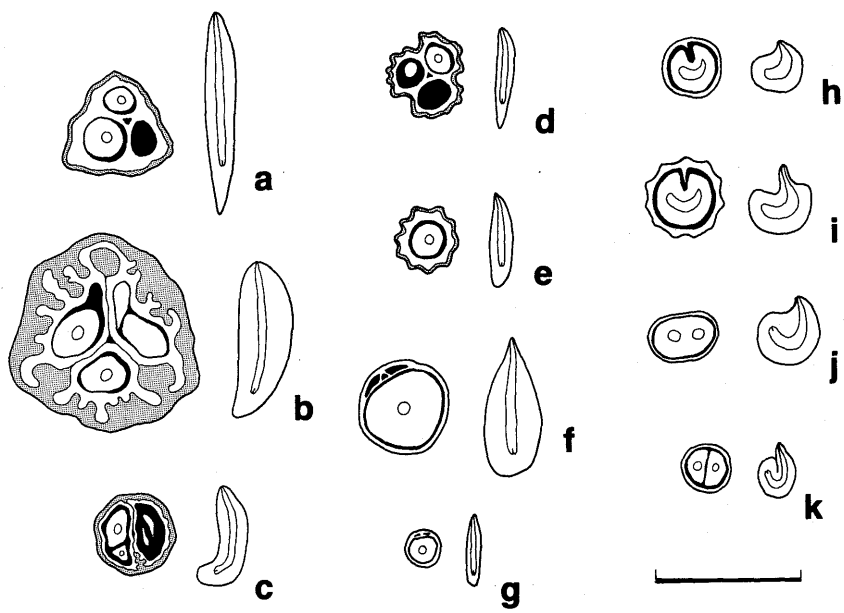


Fig. 4. Transverse sections of stones (left), and shapes of seeds and embryos (right). a: *S. boninensis* (*G. Murata et al. 646*, KYO), all locules developed, seed straight. — b: *S. tanakae* (*G. Koidzumi s.n., Sept. 1921*, KYO), all locules developed, seed slightly curved, mesocarp well developed. — c: *S. kuroki* (*Z. Tashiro s.n., 25 Aug. 1924*, KYO), all locules developed, seed longitudinally curved. — d: *S. okinawensis* (*G. Koidzumi s.n., 27–31 May 1923*, KYO), all locules developed, seed straight. — e: *S. stellaris* (*T. Shimizu 86-255*, KYO), f: *S. glauca* (*E. Kinoshita 1096*, KYO) and g: *S. prunifolia* (*N. Kurosaki 8084*, KYO), only one locule developed, seed straight. — h: *S. lancifolia* (*H. Migo s.n., 10 Nov. 1954*, KYO), only one locule developed, seed laterally curved. — i: *S. cochinchinensis* (*H. Nagamasu 1131*, KYO), only one locule developed, seed laterally curved. In this case seed twice curved. — j: *S. sawafutagi* (*N. Fukuoka 10507*, KYO), only one locule developed, seed longitudinally curved. — k: *S. myrtacea* (*Z. Tashiro s.n., 31 Aug. 1935*, KYO), only one locule developed, seed longitudinally curved.

Wood Anatomy

Vessels small and often angular, exclusively solitary, often with spiral thickening. Perforation plates scalariform, usually with more than 20 fine bars, occasionally slightly reticulate. Intervascular pitting scalariform to opposite; pitting to ray and wood parenchyma typically small and round, occasionally scalariform. Parenchyma apotracheal, as scattered cells or short uniseriate lines, the latter sometimes finely reticulate. Strands of 4–8 cells. Rays typically up to 3–5 cells wide, but occasionally not more than 2 cells wide and in some species up to 9–12 cells (in *S. spicata* Roxb.). Uniseriate rays numerous and composed entirely of upright cells; typically heterogeneous (Kribs' (1935) Types I and IIA) with 3 to many marginal rows of upright cells. Fibers with distinctly bordered pits on both radial and tangential walls. Spiral thickening commonly present. (Metcalfe & Chalk, 1950).

Yamauchi (1975) reported the wood anatomy of nine Japanese species, of which three are deciduous, and six are evergreen. As a result, she concluded on the basis of wood anatomy that Japanese Symplocaceae could be divided into two genera: *Dicalix* Lour. consisting of evergreen species with axillary inflorescences and *Palura* (G. Don) Miers consisting of deciduous species with terminal inflorescences. The important anatomical differences between the two genera were summarized as follows:

Palura: Vessels 40–85 per square millimeter, larger, 80–85 μm in tangential diameter. Mean length of vessel segments less than 900 μm (860–880 μm). Spiral thickening is lacking in vessel walls and fiber-tracheids. Ray crossing pitting smaller, 3–5 μm in diameter, opposite.

Dicalix: Vessels 100–135 per square millimeter, smaller, 40–65 μm in tangential diameter. Mean length of vessel segments longer than 900 μm (910–1430 μm). Fine spiral thickening present in vessel walls and fiber-tracheids. Ray crossing pitting larger, 4–28 μm in diameter, scalariform and intermediate between opposite and scalariform.

These differences are, however, not so clear as commented by Yamauchi (1975) herself. It is also known that spiral thickenings most frequently occur in narrow vessels (Metcalfe & Chalk, 1983). The differences of wood anatomy between evergreen and deciduous species do not seem to be enough to distinguish the genera.

Palynology

Pollen grains simple, isopolar to biconvex, 2–3(–4)-colporate with short colpi or 2–3-(–4)-porate, 20–70 μm (E), usually about 30 μm (E); exine comprising ektexine and endexine, endexine very thin but thickened near apertures; tectum pitted to reticulate; supratectal ornamentation gemmate, verrucate, corrugate, echinate, spinulate, clavate, suprareticulate or lacking, rarely globulate; columellae distinct or indistinct; foot layer rather thick.

The pollen morphology has been regarded as an important character in recognizing subgenera. In subgenera *Symplocos* and *Microsymplocos*, pollen grains have a massive tectum without supratectal ornamentation, and columellae are indistinct. In subgen. *Hopea*, pollen grains have a thin tectum with supratectal ornamentation, and columellae are distinct. Nooteboom (1975) reduced subgen. *Microsymplocos* to subgen. *Hopea* on the basis of palynological evidence provided by van der Meijden (1970). Recent works (Barth, 1979, 1982;

Nagamasu, 1989a, b) showed that the pollen grains of subgen. *Microsymplocos* is distinct from those of subgen. *Hopea* and rather similar to those of subgen. *Symplocos*.

Pollen grains of all Japanese species are examined with light and electron microscopy by Nagamasu (1989a) and classified into two types (Type I and II) primarily on the basis of wall structure. Type I, characterized by a thick tectum lacking a supratectal structure and reduced columellae occurs in *S. sonoharae* (subgen. *Symplocos*); Type II characterized by a thin tectum with supratectal structure and generally distinct columellae in subgen. *Hopea*. Within Type II, five subtypes were recognized primarily on the basis of sculpture combined with other pollen characters: suprareticulate subtype (IIa), verrucate subtype (IIb), rugulate subtype (IIc), spinulate subtype (IId) and scabrate subtype (IIe). The echinate pollen type and areolate pollen type are not observed in Japanese species. These pollen types are used in the descriptions in Taxonomic Treatment.

It should be noted that some names used by Nagamasu (1989a) are revised in this paper as follows: *S. chinensis* (Lour.) Druce to *S. sawafutagi* Nagamasu; *S. confusa* Brand to *S. sonoharae* Koidz.; *S. lucida* Sieb. & Zucc. to *S. kuroki* Nagamasu.

The pollen characters are stable within a species, and taxonomically important. On the contrary, Nooteboom (1975: 10) discussed infraspecific variations in subgen. *Hopea*, citing 8 species which have more than 2 pollen subtypes of van der Meijden (1970). Of 8 species cited by Nooteboom, *S. cochinchinensis* has 5 subtypes, and *S. ophirensis* has 3 subtypes. He commented that within subgen. *Hopea*, a peculiar pattern of variation is found, possibly reflecting reticulate relationships between the species concerned. These infraspecific variations, however, seem to be due to his extremely wide species concept. In Nooteboom's revision (1975), *S. cochinchinensis* consists of 4 subspecies, 29 varieties and one topodeme, and *S. ophirensis* comprises 3 subspecies and 7 varieties.

Cytology

The reported chromosome numbers of the genus *Symplocos* are n = 11 (Mehra & Bawa 1969; Nooteboom, 1975; Mehra, 1976; Bir et al., 1984; Carr & McPherson, 1986; Catha & Bir, 1987), 12 (Nevling, 1969), 14 (Hardin, 1966), 2n = 22 (Mehra & Bawa, 1968; Mehra, 1972; Nooteboom, 1975; Bedi et al., 1985; Ono, 1975, 1977, 1990), 24 (Borgmann, 1964) and ca. 90 (Nooteboom, 1975). All recent authors reported n = 11 + 0–2B and/or 2n = 22 + 0–2B. The basic number of the genus is probably x = 11 and Asiatic species of subgen. *Hopea* are mostly diploids as pointed by Nooteboom (1975). He assumed that the reports of n = 12 or 14, 2n = 24 were errorneous counts due to the presence of B chromosomes. In Japan, the chromosome numbers of two species endemic to the Bonin Isls. have been reported as 2n = 22 (Table 1; Ono, 1975, 1977, 1990). I newly examined three Japanese species in the present study, *S. sonoharae, S. stellaris*, and *S. tanakae*, whose chromosome numbers were 2n = ca. 90, n = 11, 2n = 22, respectively (Table 1). In subgen. *Symplocos* only one count has been made by Nooteboom (1975) as 2n = ca. 90. He supposed this species *S. pendula* var. *confusa*, is an octaploid. The chromosomes of *S. sonoharae*, which is the only species of subgen. *Symplocos* in Japan, was interpreted to be 2n = ca. 90. It agrees with the previous count, although the chromosomes are minute and I could not decide exact

Table 1. Chromosome numbers of Japanese *Symplocos*.

Species	n	2n	Source	Literature
S. boninensis		22	Mukohjima Is., Bonin Isls. Cult. in Tokyo	Ono (1990)
S. pergracilis		22	Chichijima Is., Bonin Isls. Cult. in Tokyo	Ono (1975)
		22	Chichijima Is., Bonin Isls. Cult. in Tokyo	Ono (1977)
		22	Chichijima Is., Bonin Isls. Cult. in Tokyo	Ono (1990)
S. sonoharae		ca.90	Mt. Inokawadake, Tokunoshima Isl. seedling from *Tamura et al. 47* (KYO)	present study
S. stellaris	11		Mt. Nagodake, Okinawa Is. *Nagamasu 1663* (KYO)	present study
S. tanakae		22	Yakushima Is. *Nagamasu*, cult. Kyoto Univ.	present study

number. In subgen. *Microsymplocos* distributed in the New World, only one species has been investigated and reported to be n = 12 (*S. micrantha* Krug & Urban: Nevling, 1969).

Infrageneric Classification

The Symplocaceae are morphologically diverse, and often classified into several genera. Miers (1879) recognized 14 genera in the family. In Japanese species, Nakai (1922, 1927) recongnized two genera, *Palura* (G. Don) Miers and *Bobua* DC. correlating to the deciduous habit with terminal inflorescences and to the evergreen habit with axillary inflorescences, respectively. Hatusima (1936) added *Cordyloblaste* Moritzi with monadelphous stamens, this treatment was followed by Hara (1948) although *Bobua* was replaced with *Dicalix* Lour. Recent authors, however, treat this family as monotypic.

Brand (1901) divided the genus into four subgenera, with special reference to the corolla and staminal morphology, subgen. *Eusymplocos* with monadelphous stamens and a long corolla tube, subgen. *Microsymplocos* Brand with monadelphous stamens and a short corolla tube, subgen. *Hopea* (L.) Clarke with pentadelphous stamens and a short corolla tube and subgen. *Epigenia* Brand with free stamens and a short corolla tube. Nooteboom (1975) reduced subgen. *Microsymlocos* and subgen. *Epigenia* to subgen. *Hopea*, recognizing only two subgenera on the basis of palynological and brief phytochemical data. On the contrary, Barth (1979) discussed that the pollen morphology of Brazilian *Symplocos* agrees with Brand's three subgenera *Eusymplocos, Microsymplocos* and *Epigenia*. Nagamasu (1989a, b) pointed that the pollen of subgen. *Microsymplocos* is distinct from that of subgen. *Hopea*, but rather similar to that of subgen. *Eusymplocos*, but between the pollen morphology of subgenera *Epigenia* and *Hopea*, there is no significant differences. Brand (1901) distinguished these two subgenera by the staminal morphology and geographical distribution, namely American species with free stamens (subgen. *Epigenia*) or Asiatic species with pentadelphous stamens (subgen. *Hopea*). Asiatic species, however, do not always have distinct

Table 2. Distinctive characters of Japanese *Symplocos* and their distribution.

	habit	midrib	inflorescence	bract
Subgen. *Symplocos*				
1. *S. sonoharae*	evergreen	impressed	axillary raceme	persistent
Subgen. *Hopea*				
Sect. *Palura*				
2. *S. coreana*	deciduous	impressed	terminal panicle	caducous
3. *S. sawafutagi*	deciduous	impressed	terminal panicle	caducous
4. *S. paniculata*	deciduous	impressed	terminal panicle	caducous
5. *S. tanakana*	deciduous	impressed	terminal panicle	caducous
Sect. *Lodhra*				
6. *S. myrtacea*	evergreen	impressed	axillary simple raceme	caducous
7. *S. liukiuensis*	evergreen	impressed	axillary simple raceme	caducous
8. *S. caudata*	evergreen	impressed	axillary simple raceme	caducous
9. *S. prunifolia*	evergreen	impressed	axillary simple raceme	caducous
Sect. *Bobu*				
10. *S. konishii*	evergreen	impressed	axillary branched spike	persistent
11. *S. cochinchinensis*	evergreen	impressed	axillary branched spike	persistent
12. *S. theophrastifolia*	evergreen	impressed	axillary branched spike	persistent
Sect. *Lancifoliae*				
13. *S. lancifolia*	evergreen	slightly prominent or sulcate	axillary spike	persistent
14. *S. microcalyx*	evergreen	slightly prominent or sulcate	axillary spike	persistent
Sect. *Glaucae*				
15. *S. glauca*	evergreen	impressed	axillary condensed spike	persistent
Sect. *Glomeratae*				
16. *S. stellaris*	evergreen	impressed	axillary condensed spike	persistent
Sect. *Palaeosymplocos*				
17. *S. nakaharae*	evergreen	prominent	axillary, condensed branched spike	persistent
18. *S. kuroki*	evergreen	prominent	axillary, condensed branched spike	persistent
19. *S. pergracilis*	evergreen	prominent	axillary condensed spike	persistent
20. S. *boninensis*	evergreen	prominent	axillary, condensed branched spike	persistent
21. S. *tanakae*	evergreen	prominent	axillary, condensed branched spike	persistent
22. S. *kawakamii*	evergreen	prominent	axillary, condensed branched spike	persistent
Sect. *Okinawenses*				
23. *S. okinawensis*	evergreen	prominent	axillary raceme	persistent

stamens	disk	ovary	stone	seeds	Pollen type
monadelphous	hairy	2-locular	1-locular	straight	I
pentadelphous	glabrous /hairy	2-locular	1-locular	longitudinally curved	IIa
pentadelphous	glabrous /hairy	2-locular	1-locular	longitudinally curved	IIa
pentadelphous	glabrous	2-locular	1-locular	longitudinally curved	IIa
pentadelphous	glabrous	2-locular	1-locular	longitudinally curved	IIa
connate at base	glabrous	3-locular	1-locular	longitudinally curved	IIb
connate at base	glabrous	3-locular	1-locular	longitudinally curved	IIc
connate at base	glabrous	3-locular	1-locular	longitudinally curved	IIb
indistinctly pentadelphous	glabrous	3-locular	1-locular	straight	IIc
indistinctly pentadelphous	glabrous	3-locular	1-locular	laterally curved	IId
indistinctly pentadelphous	glabrous	3-locular	1-locular	laterally curved	IId
indistinctly pentadelphous	glabrous	3-locular	1-locular	laterally curved	IId
connate at base	glabrous	3-locular	1-locular	laterally curved	IIc
pentadelphous	hairy	3-locular	1-locular	laterally curved	IIb
indistinctly pentadelphous	glabrous	3-locular	1-locular	straight	IIc
pentadelphous	glabrous	3-locular	1-locular	straight	IIe
pentadelphous	hairy	2-locular	2-locular	longitudinally curved	IIb
pentadelphous	hairy	2-locular	2-locular	longitudinally curved	IIb
pentadelphous	hairy	3-locular	3-locular	straight	IIb
pentadelphous	hairy	3-locular	3-locular	straight	IIb
pentadelphous	hairy	3-locular	3-locular	longitudinally curved	IIb
pentadelphous	hairy	3-locular	3-locular	longitudinally slightly curved	IIb
pentadelphous	hairy	3-locular	3-locular	straight	IIc

pentadelphous stamens.

In conclusion, subgen. *Microsymplocos* should be treated as a distinct taxon from both subgenera *Symplocos* and *Hopea*, and subgen. *Epigenia* could be reduced to subgen. *Hopea*. New subgeneric system is proposed as follows.

1. subgenus **Symplocos**

Corolla connate at least half way, forming distinct tube; stamens monadelphous, forming long staminal tube, filaments flattened; pollen grains with massive tectum without supratectal ornamentation, columellae indistinct.

2. subgenus **Microsymplocos** Brand

Corolla deeply divided to the base; stamens monadelphous, but tube very short, filaments cylindrical; pollen grains with massive tectum without supratectal ornamentation, columellae indistinct.

3. subgenus **Hopea** (L.) Clarke

Corolla deeply divided to the base; stamens free or pentadelphous, filaments cylindrical; pollen grains with thin tectum with supratectal ornamentation, columellae distinct.

Brand (1901) divided subgen. *Hopea* into two sections, *Palaeosymplocos* Brand with distinctly pentadelphous stamens and *Bobua* (DC.) Brand with indistinctly pentadelphous stamens. Handel-Mazzetti (1943) recognized 4 sections, *Palaeosymplocos, Lodhra, Bobua* and *Palura*, in the subgen. *Hopea* (he used subgen. *Eosymplocos* Hand.-Mazz.) of China. He regarded the following characters as important: midrib impressed or prominent on upper surface; the shape of fruits; disk glabrous or hairy; ovary 2- or 3-locular. Nooteboom (1975) did not subdivide subgen. *Hopea* in his revision at all. Recently, Wu (1986a & b, 1987) recognized six sections in China, principally based on the characters of inflorescence and the shape of fruits, adding two sections to Handel-Mazzetti's system, namely sect. *Glomeratae* and sect. *Singuliflorae*. These sections are characterized by a glomerate and a uniflowered inflorescence, respectively.

In the present study, I classify Japanese species of subgen. *Hopea* into eight sections based on the morphological characters listed in Table 2. Three sections, *Glaucae, Lancifoliae* and *Okinawenses* are newly described.

Taxonomic Treatment

Symplocaceae Desfontaines, *nom. conserv.*

'Symploceae' Desfontaines, Mem. Mus. Hist. Nat. Paris 6: 9 (1820). — Type: *Symplocos* Jacq.

Evergreen or deciduous shrubs or trees. *Leaves* simple, alternate, exstipulate. *Inflorescences* axillary or terminal; racemes, spikes, panicles, fascicles or condensed clusters, or rarely flowers solitary. *Flowers* with a bract and 2 bracteoles; actinomorphic, bisexual, or plants rarely polygamous; calyx lobes (3–)5, imbricate or valvate; corolla shallowly or deeply (3–)5(–11)-lobed, the lobes imbricate; stamens 4 to many in 1–4 series, inserted on the corolla, free, pentadelphous or monadelphous; anthers introrse, bilocular, longitudinally dehiscent; ovary inferior or semi-inferior, 2- to 5-locular; style single, slender, the base surrounded by a nectary disk; ovules 2–4 in each locule, pendulous on axile placentae, anatro-

pous, epitropous or amphitropous, unitegmic, tenuinucellate. *Pollen grains* in monads, 2–3-colporate or 3-porate, oblate to oblate-spheroidal. *Fruits* monopyrenous drupes, usually crowned by persistent calyx lobes; seeds usually solitary in each developed cell, straight or curved, with copious endosperm; embryo straight or curved, with very short cotyledons. *Seedlings* epigeal, phanerocotylar; cotyledons 2, linear, slightly thick; hypocotyl terete, slender, usually densely papillate; leaves all spirally arranged. X = 11(–14).

One genus with 300 to 400 species, in moist tropical, subtropical and temperate regions of Asia, Oceania and America.

Symplocos Jacquin

Symplocos Jacquin, Enum. Syst. Pl.: 5, 24 (1760); DC., Prodr. 8: 246 (1844); Miers, J. Linn. Soc. Bot. 17: 285 (1879); Brand, Pfl. R. Heft 6: 13 (1901); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 1 (1943); Nooteboom, Leid. Bot. Ser. 1: 33 (1975); Wu, Fl. Reip. Pop. Sin. 60(2): 1 (1987). — Type: *Symplocos martinicensis* Jacq.

Bobu Adanson, Fam. Pl. 2: 88, 526 (1763); DC., Prodr. 3: 23 (1828), *ut* '*Bobua*'; Nakai, Tr. & Shr. 1: 223 (1922). — *Eugeniodes* ['*Eugenioides*' Linn., Fl. Zeyl.: 192 (1747)] O. Kuntze, Rev. Gen. Pl. 2: 409, 975 (1891), *nom. illeg.* — *Symplocos* sect. *Bobua* Brand, Pfl. R. Heft 6: 25, 32 (1901); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4 (1943); Wu, Fl. Reip. Pop. Sin. 60(2): 51 (1987). — Type: *Bobua laurina* (Retz.) DC.

Hopea Garden *ex* Linn., Syst. Nat. ed. 12: 509 (1767); Mant. Pl. 105 (1767), *nom. rejic., non* Roxb. (1811). — *Symplocos* sect. *Hopea* Benth. & Hook., Gen. Pl. 2: 668 (1876). — *Protohopea* Miers, J. Linn. Soc. Bot. 17: 289 (1879). — *Symplocos* subgen. *Hopea* Clarke, Fl. Br. Ind. 3: 572 (1882); Brand, Pfl. R. Heft 6: 25 (1901); Nooteboom, Leid. Bot. Ser. 1: 43 (1975); Wu, Fl. Reip. Pop Sin. 60(2): 8 (1987). — Type: *Hopea tinctoria* Linn.

Ciponima Aubl., Hist. Pl. Guin. Fr.: 567 (1775). — *Symplocos* sect. *Ciponima* Benth. & Hook., Gen. Pl. 2: 669 (1876). — *Symplocos* subgen. *Ciponima* Clarke, Fl. Br. Ind. 3: 587 (1882). — Type: *Ciponima guianensis* Aubl.

Alstonia Mutis *ex* Linn. f., Suppl. Pl.: 39 (1781), *non* R. Br. (1810), *nom. conserv., nec* Scopoli (1777), *nom. rejic.* — *Symplocos* sect. *Alstonia* G. Don, Gen. Syst. 4: 1 (1837 or 1838); Benth. & Hook., Gen. Pl. 2: 669 (1876). — *Praealstonia* Miers, J. Linn. Soc. Bot. 17: 291 (1879). — Type: *Alstonia theaeformis* Linn. f.

Decadia Lour., Fl. Cochinch. 1: 315 (1790). — Type: *Decadia aluminosa* Lour.

Dicalix Lour., Fl. Cochinch. 1: 663 (1790); Hara, Enum. Sperm. Jap. 1: 103 (1948). — Type: *Dicalix cochinchinensis* Lour.

Drupatris Lour., Fl. Cochinch. 1: 314 (1790). — Type: *Drupatris cochinchinensis* Lour.

Barberina Vell., Fl. Flumin.: 235 (1825). — *Symplocos* sect. *Barberina* DC., Prodr. 8: 253 (1844); Brand, Pfl. R. Heft 6: 25, 26 (1901). — *Symplocos* subsect. *Barberina* Benth. & Hook., Gen. Pl. 2: 668 (1876). — Type: *Barberina hirsuta* Vell.

Mongezia Vell., Fl. Flumin.: 183 (1825).

Sariava Reinw., Syll. Ratisb. 2: 12 (1825).

Stemmatosiphum Pohl, Pl. Bras. Ic. 2: 86, t. 157–159 (1831).

Symplocos sect. *Lodhra* G. Don, Gen. Syst. 4: 2 (1837 or 1838); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4, 18 (1943); Wu, Fl. Reip. Pop. Sin. 60(2): 19 (1987). — *Lodhra* Guillemin, Ann. Sc. Nat. Ser. 2(15): 158 (1841), *nom. illeg.*; Decaisne, Voy. Jacquinot 4: 104 (1844), *quoad basionym*; Miers, J. Linn. Soc. Bot. 17: 298 (1879). — *Symplocos* subsect. *Lodhra* Benth. & Hook., Gen. Pl. 2: 668 (1876); Brand, Pfl. R. Heft 6: 25, 42. — Type: *Symplocos racemosa* Roxb.

Symplocos sect. *Palura* G. Don, Gen. Syst. 4: 3 (1837 or 1838); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4, 38 (1943); Wu, Fl. Reip. Pop. Sin. 60(2): 72 (1987). — *Symplocos* subsect. *Palura* Benth. & Hook., Gen. Pl. 2: 668 (1876). — *Palura* Miers, J. Linn. Soc. Bot. 17: 297 (1879); Nakai, Tr. & Shr. 1: 228 (1922); Hara, Enum. Sperm. Jap. 1: 107 (1948). — Lectotype: *Symplocos crataegoides* Ham. *ex* G. Don (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 34 (1975)).

Scyrtocarpus Miers in Lindl., Veg. Kingd.: 593a (1847).

Cordyloblaste Moritzi, Bot. Zeit. 6: 606 (1848); Ridley, Fl. Mal. Pen. 2: 307 (1923); Hatusima, J. Jap. Bot. 12: 281 (1936). — *Symplocos* sect. *Cordyloblaste* Benth. & Hook., Gen. Pl. 2: 669 (1876); Brand, Pfl. R. Heft 6: 26, 88 (1901). — *Symplocos* subgen. *Cordyloblaste* Gamble, J. As. Soc. Beng. 74(2), extra number 248 (1906). — Type: *Cordyloblaste henschelii* Moritzi

Carlea Presl, Epimel. Bot.: 216 (1851). — Type: *Carlea oblongifolia* Presl

Barandra Llanos, Mem. Acad. Cienz. Madr. 3(2): 502 (1857). — Type: *Barandra angatensis* Llanos

Hypopogon Turcz., Bull. Soc. Imp. Nat. Mosc. 31(1): 246 (1858). — Type: *Hypopogon brevipes* Turcz.

Chasseloupia Vieill., Bull. Soc. Linn. Norm. 10: 101 (1866). — Lectotype: *Chasseloupia lucida* Vieill. (Lectotypification: Nooteboom, Blumea 26: 411 (1980)).

Suringaria Pierre, Bull. Soc. Linn. Paris 1: 635 (1866). — Type: *Suringaria cambodiana* Pierre

Symplocos subgen. *Eusymplocos* Brand, Pfl. R. Heft 6: 26, 73 (1901). — Type: *Symplocos martinicensis* Jacq.

Symplocos subgen. *Microsymplocos* Brand, Pfl. R. Heft 6: 25, 70 (1901).

Symplocos sect. *Neosymplocos* Brand, Pfl. R. Heft 6: 25, 70 (1901).

Symplocos sect. *Palaeosymplocos* Brand, Pfl. R. Heft 6: 25, 30 (1901); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4, 13 (1943); Wu, Fl. Reip. Pop. Sin. 60(2): 8 (1987). — Lectotype: *Symplocos phyllocalyx* Clarke, Fl. Br. Ind. 3: 575 (1882). Redesignated here. See the note under Sect. 7. *Palaeosymplocos* Brand (p. 191).

Symplocos sect. *Pseudosymplocos* Brand, Pfl. R. Heft 6: 25, 30 (1901); Mai, Fedde. Repert. 97(1–2): 9 (1986).

Symplocos sect. *Symplocastrum* Brand, Pfl. R. Heft 6: 26, 73 (1901).

Symplocos sect. *Urbaniocharis* Brand, Pfl. R. Heft 6: 25, 70 (1901); Mai, Fedde. Repert. 97(1–2): 13 (1986).

Symplocos subsect. *Ciponimastrum* Brand, Pfl. R. Heft 6: 26, 78 (1901).

Symplocos subsect. *Pseudoalstonia* Brand, Pfl. R. Heft 6: 26, 73 (1901).

Symplocos subgen. *Eosymplocos* Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 4 (1943). — Lectotype: *Symplocos racemosa* Roxb. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 34).

Symplocos sect. *Glomeratae* Y.-F. Wu, Acta Phytotax. Sin. 24(3): 193 (1986); Fl. Reip. Pop. Sin. 60(2): 58 (1987). — Type: *Symplocos glomerata* King & Gamble

Symplocos sect. *Singuliflorae* Y.-F. Wu, Acta Phytotax. Sin. 24(3): 193 (1986); Fl. Reip. Pop. Sin. 60(2): 17 (1987). — Type: *Symplocos ovatilobata* Nooteboom

Symplocos subgen. *Epigenia sensu* Brand, Pfl. R. Heft 6: 25, 26 (1901), *excl. basionym, Epigenia* Vell., Fl. Flumin.: 183 (1825).

Key to the subgenera

1a. Petals connate at least half way, forming a distinct corolla tube; stamens monadelphous; filaments flattened, abruptly narrowed at apex forming a short whip ..... Subgen. 1. *Symplocos*

1b. Petals connate only at base; stamens pentadelphous or connate at base; filaments cylindrical, gradually narrowed toward the apex ..... Subgen. 2. *Hopea* (L.) Clarke

Subgen. 1. **Symplocos**

Symplocos Jacq. — *Ciponima* Aubl. — *Alstonia* Mutis *ex* Linn. f. — *Mongezia* Vell. — *Stemmatosiphum* Pohl — *Cordyloblaste* Moritzi — *Hypopogon* Turcz. — *Symplocos* subgen. *Eusymplocos* Brand — *Symplocos* sect. *Symplocastrum* Brand — *Symplocos* subsect. *Pseudoalstonia* Brand — *Symplocos* subsect. *Ciponimastrum* Brand.

Leaves usually not becoming yellow when dry. *Flowers*: petals connate at least half way, forming a distinct corolla tube; stamens monadelphous; lower part of staminal tube adherent to corolla tube; filaments flattened and abruptly narrowed at apex, forming a short whip; ovary 2–5-locular. *Pollen grains* 2–3-colporate; tectum massive, perforate to foveolate, without distinct supratectal ornamentation; columellae indistinct.

More than 100 species in Asia and the New World. One species in Japan (Ryukyu).

1. *Symplocos sonoharae* Koidz.

Subgen. 2. **Hopea** (L.) Clarke

Bobu Adanson — *Hopea* Garden *ex* L. *non* Roxb. — *Decadia* Lour. — *Dicalix* Lour. — *Drupatris* Lour. — *Barberina* Vell. — *Sariava* Reinw. — *Symplocos* sect. *Lodhra* G. Don — *Symplocos* sect. *Palura* G. Don — *Scyrtocarpus* Miers — *Carlea* Presl — *Barandra* Llanos — *Chasseloupia* Vieill. — *Suringaria* Pierre — *Symplocos* sect. *Palaeosymplocos* Brand — *Symplocos* sect. *Pseudosymplocos* Brand — *Symplocos* subgen. *Eosymplocos* Hand.-Mazz. — *Symplocos* sect. *Glomeratae* Y.-F. Wu — *Symplocos* sect. *Singuliflorae* Y.-F. Wu — *Symplocos* subgen. *Epigenia sensu* Brand.

Leaves usually becoming yellow when dry. *Flowers*: petals connate only at base; stamens pentadelphous or free, connate only at base, and adnate to corolla tube at base; filaments cylindrical, gradually narrowed to the apex; ovary 2–3-locular. *Pollen grains* 3-colporate or 3-porate; tectum thin, reticulate, usually with distinct supratectal ornamentation; columellae distinct.

About 200 species in Asia, Oceania and the New World. 22 species in Japan.

Key to the sections of subgen. *Hopea*

1a. Deciduous trees or shrubs; inflorescences terminal, paniculate ..... Sect. 1. *Palura* G. Don
1b. Evergreen trees or shrubs; inflorescences axillary.
2a. Bracts caducous; inflorescences racemose ..... Sect. 2. *Lodhra* G. Don
2b. Bracts persistent.
3a. Inflorescences simply or compoundly spicate (flowers sissile or rarely shortly pedicellate), rarely 1-flowered.
4a. Inflorescences elongate spikes.
5a. Leaf-midrib impressed above; spikes usually branched near the base; stones ampulliform; seeds twice curved ..... Sect. 3. *Bobu* (Adanson) Brand
5b. Leaf-midrib slightly prominent or sulcate above; spikes usually simple; stones ovoid to obovoid; seeds (once) curved ..... Sect. 4. *Lancifoliae* Nagamasu
4b. Inflorescences 1-flowered or condensed spikes, often in head-like clusters.
6a. Midrib of leaf impressed on upper surface; twigs and terminal buds more or less hairy; disk glabrous or hairy.
7a. Leaves papillate on lower surface; stones rather smooth ..... Sect. 5. *Glaucae* Nagamasu
7b. Leaves not papillate on lower surface; stones with 10 longitudinal grooves ..... Sect. 6. *Glomeratae* Y.-F. Wu
6b. Midrib of leaf prominent on upper surface, at least in life; twigs and terminal buds glabrous; disk hairy ..... Sect. 7. *Palaeosymplocos* Brand
3b. Inflorescences racemose (flowers distinctly pedicellate); midrib of leaf prominent on upper surface ..... Sect. 8. *Okinawenses* Nagamasu

Sect. 1. **Palura** G. Don

Symplocos sect. *Palura* G. Don

Deciduous trees or shrubs. *Leaves*: midrib impressed above. *Inflorescences* terminal panicles. *Flowers*: ovary 2-locular; disk 5-glandular, glabrous or pilose. *Fruits*: one locule developed; seed 1, longitudinally curved with curved embryo. *Pollen grains* 3-colporate,

semi-lobate to semi-angular in polar view, oblate in equatorial view; surface ornamentation suprareticulate.

2. *Symplocos coreana* (Lév.) Ohwi
3. *Symplocos sawafutagi* Nagamasu
4. *Symplocos paniculata* (Thunb. *ex* Murray) Miq.
5. *Symplocos tanakana* Nakai

Sect. 2. **Lodhra** G. Don

Symplocos sect. *Lodhra* G. Don

Evergreen trees or shrubs. *Leaves*: midrib impressed above. *Inflorescences* axillary racemes; bracts caducous. *Flowers*: stamens pentadelphous or connate only at the base; disk glabrous or hairy; ovary 3-locular. *Fruits*: 1 to 3-locular; seed mostly 1, straight or longitudinally curved. *Pollen grains* usually 3-colporate, surface ornamentation verrucate or corrugate.

6. *Symplocos myrtacea* Sieb. & Zucc.
   6-1. var. *myrtacea*
   6-2. var. *latifolia* Hatusima
7. *Symplocos liukiuensis* Matsumura
   7-1. var. *liukiuensis*
   7-2. var. *iriomotensis* Nagamasu
8. *Symplocos caudata* Wall. *ex* G. Don
9. *Symplocos prunifolia* Sieb. & Zucc.
   9-1. var. *prunifolia*
   9-2. var. *tawadae* Nagamasu

Sect. 3. **Bobu** (Adanson) Brand

Bobu Adanson — *Decadia* Lour. — *Dicalix* Lour. — *Drupatris* Lour.

Evergreen trees or shrubs. *Leaves*: midrib impressed above. *Inflorescences* axillary, elongate spikes usually branched at base; bracts persistent. *Flowers*: stamens indistinctly pentadelphous; disk glabrous; ovary 3-locular. *Fruits*: one locule developed; seed 1, twice curved and laterally developed. *Pollen grains* 3-colporate or 3-porate; surface ornamentation verrucate to spinulate.

10. *Symplocos konishii* Hayata
11. *Symplocos cochinchinensis* (Lour.) Moore
12. *Symplocos theophrastifolia* Sieb. & Zucc.

Sect. 4. **Lancifoliae** Nagamasu, **sect. nov.**

Fruteces vel arbores sempervirentes. Costa supra leviter prominens ad impressa. Inflorescentia axillaris simplex elongata-spicata vel elongata-racemosa pedicellis brevissimis, bracteis persistentibus. Fructus 1-loculares cum 1 semine latororsum curvato. — Typus: *Symplocos lancifolia* Sieb. & Zucc., Fam. Nat. 2: 133 (1846).

Evergreen trees or shrubs. *Leaves*: midrib slightly prominent to sulcate above. *Inflorescences* axillary, elongate spikes or shortly pedicellate racemes, usually simple; bracts persistent. *Flowers*: stamens connate at the base or pentadelphous; disk glabrous or hairy; ovary 3-locular. *Fruits* 1-locular; seed 1, laterally curved. *Pollen grains* 3-colporate or 3-porate; surface ornamantation verrucate or corrugate.

13. *Symplocos lancifolia* Sieb. & Zucc.
14. *Symplocos microcalyx* Hayata

Sect. 5. **Glaucae** Nagamasu, **sect. nov.**

Fruteces vel arbores sempervirentes. Costa supra impressa. Inflorescentia axillaris vel cauliflora, contracta-spicata, spicis saepe ramosis, bracteis persistentibus. Fructus 1-locularis cum semine recto. —Typus: *Symplocos glauca* (Thunb.) Koidz., Bot. Mag. Tokyo 39: 313 (1925).

Evergreen shrubs or trees. *Leaves*: midrib impressed above. *Inflorescences* axillary and/or cauliflorous, condensed spikes in head-like clusters, often branched; bracts persistent. *Flowers*: stamens pentadelphous, disk glabrous or hairy; ovary 3-locular. *Fruits* 1-locular; stone smooth; seed 1, straight. *Pollen grains* 3-colporate or 3-porate; surface ornamentation corrugate to verrucate.

15. *Symplocos glauca* (Thunb.) Koidz.

Sect. 6. **Glomeratae** Y.-F. Wu

Symplocos sect. *Glomeratae* Y.-F. Wu

Evergreen shrubs or trees. *Leaves*: midrib impressed above. *Inflorescences* axillary and/or cauliflorous spikes, condensed in head-like clusters; bract persistent. *Flowers*: stamens pentadelphous; disk glabrous or hairy; ovary 3-locular. *Fruits* 1 to 3-locular; stone with ca. 10 longitudinal grooves; seed mostly 1, straight.

16. *Symplocos stellaris* Brand

Sect. 7. **Palaeosymplocos** Brand

Symplocos sect. *Palaeosymplocos* Brand

Evergreen trees or shrubs. *Leaves*: midrib prominent above. *Inflorescences* axillary spikes, branched at the base, often condensed in head-like clusters; bracts persistent, lower ones often sterile. *Flowers*: stamens pentadelphous; disk hairy; ovary 2- or 3-locular. *Fruits* 1- to 3-locular, usually all locules developed; seeds 1–2 in each locule, straight or longitudinally curved.

17. *Symplocos nakaharae* (Hayata) Masamune
18. *Symplocos kuroki* Nagamasu
19. *Symplocos pergracilis* (Nakai) Yamazaki
20. *Symplocos boninensis* Rehder & Wilson
21. *Symplocos tanakae* Matsumura
22. *Symplocos kawakamii* Hayata

Note. *Symplocos japonica* A. DC. was selected as the lectotype of sect. *Palaeosymplocos* Brand by Nooteboom in his revision (1975). As commented in the notes under *S. kuroki* Nagamasu, *S. japonica* is nomenclaturally identical with *Pourthiaea villosa* var. *laevis* (Rosaceae), whose morphological character disagrees with the protologue for the section, '*Stamina manifeste pentadelpha*.' I select *S. phyllocalyx* Clarke as the lectotype species of sect. *Palaeosymplocos* replacing *S. japonica* A. DC.

Sect. 8. **Okinawenses** Nagamasu, **sect. nov.**

Arbores vel fruteces sempervirentes. Costa supra elevata. Inflorescentia axillaris racemosa base raro ramosa, bracteis persistentibus. Flores staminibus pentadelphis, ovario 3-loculari, disco pubescenti. Frucutus 3-loculares 1 semine in quoque loculo. —Typus: *Symplocos okinawensis* Matsumura, Bot. Mag. Tokyo 15: 78 (1901).

Evergreen trees or shrubs. *Leaves*: midrib prominent above. *Inflorescences* axillary racemes, rarely branched at the base; bracts persistent. *Flowers*: stamens pentadelphous; disk hairy; ovary 3-locular. *Fruits* 3-locular; seed 1 in each locule, straight.

23. *Symplocos okinawensis* Matsumura

Subgen. 1. **Symplocos**

1. **Symplocos sonoharae** Koidzumi—Fig. 3-1, Map 1, Plate 53a.

S. sonoharai Koidzumi, Pl. Nov. Amami-Oshima: 6 (1928); Makino & Nemoto, Fl. Jap. ed. 2: 918 (1931). —Lectotype: *S. Sonohara 1* (KYO, Plate 53a), Utchina Is., Ryukyu Isls. (designated here).

S. confusa Brand var. *lysiostemon sensu* Hand.-Mazz., Sitzganz. Ak. W. W. 68: 92 (1921), *non vidi*; Symb. Sin. 7: 808 (1936); Beih. Bot. Centralbl. 62-B: 40 (1943), *p.p., excl. typ., Poilane 7209* (P, isotype in P!).

Cordyloblaste confusa auct.: Hatusima, J. Jap. Bot. 12: 282 (1936); Hara, Enum. Sperm. Jap. 1: 103 (1948).

Bobua confusa auct.: Sonohara, Useful Tr.: 83 (1952).

S. confusa auct. *non* Brand: Walker, Imp. Tr. Ryukyu Is.: 261, *excl.* t. 167 (1954); Hatusima, Fl. Ryukyus: 447 (1971); Walker, Fl. Okinawa S. Ryukyu Is.: 830, *excl.* t. 164 (1976); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, pl. 193-3 (1989); Shimabuku, Check List Ryukyu Is.: 352 (1990).

S. pendula var. *hirtystylis sensu* Nooteboom, Leid. Bot. Ser. 1: 42 (1975), *p.p.*

Distr. Japan (Ryukyu), Taiwan, S China, ?Indochina.

Note. This species has been confused with *S. confusa* Brand, but the latter is distinguished by the subspherical disk narrowed toward the base of style and the larger corolla and fruits.

Key to the varieties

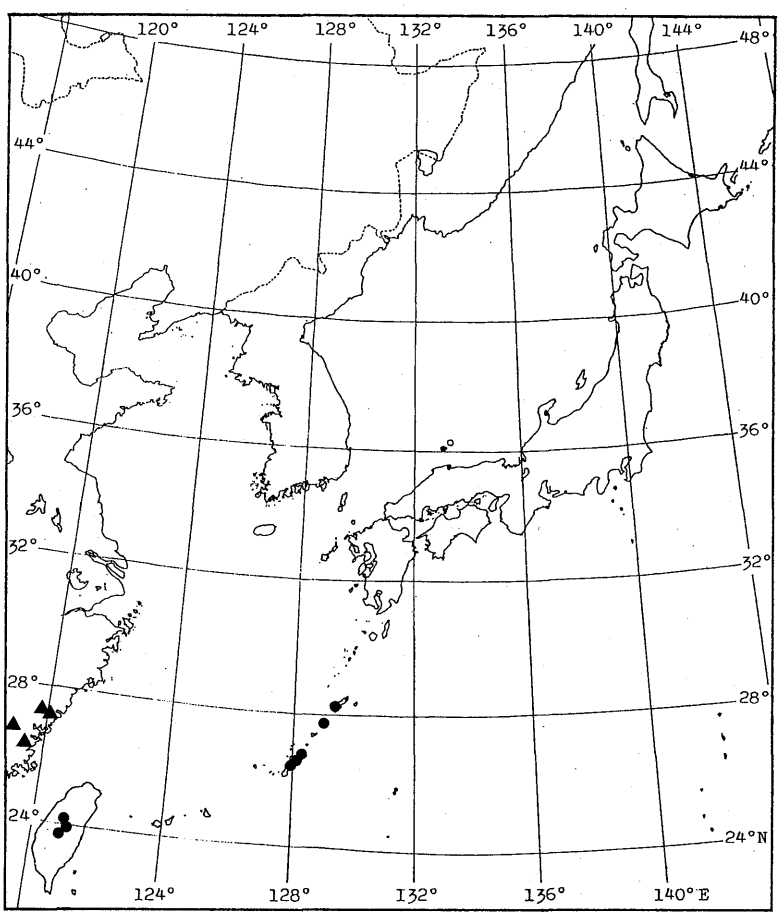
1a. Blades elliptic, sometimes obovate, brown to dark brown when dry; nerves 5–8-paired; fruits ellipsoid, sparsely pilose, 6–9 mm long. ..... 1-1. var. *sonoharae*

1b. Blades oblong, elliptic to narrowly obovate, yellowish brown to brown when dry; nerves (7–)8–11-paired; fruits ovoid, pilose, 5–6 mm long. (China). ..... 1-2. var. *oblonga*

1-1. var. **sonoharae**

S. sonoharae Koidz.

Evergreen trees; bark gray-brown, smooth. Twigs grayish dark brown, terete; young twigs brown, sparsely appressed hairy, glabrescent, ridged below petioles. Terminal buds white to pale brown, obliquely ovoid, acute at apex, densely appressed hairy, 1–3 mm long. *Leaves*: blades coriaceous, elliptic, sometimes obovate, brown to dark brown when dry, (5–)-6–9 cm long, (2–)2.5–4 cm wide; apex obtuse to acuminate; base cuneate to (shortly) attenuate; margin slightly recurved, entire or glandular crenate-serrate with teeth 5–10 mm apart; both surfaces glabrous; midrib impressed above, prominent beneath; nerves 5–8-paired, slightly prominent beneath; reticulation obscure; petioles glabrous or sparsely hairy, narrowly winged, sulcate above, 7–15 mm long. Inflorescence an axillary short raceme



Map 1. Distribution of *Symplocos sonoharae* Koidz. Var. *sonoharae* (disk) and var. *oblonga* Nagamasu (triangle).

(botryoid), 1 to 5-flowered, to 1 cm long, axis and pedicels with dense appressed white hairs; pedicels to 3 mm long; bracts and bracteoles persistent, with same indument as inflorescence axis; bracts elliptic to ovate, obtuse to acute at apex, 1–2 mm long; bracteoles 2, ovate, acute at apex, 0.5–1 mm long. *Flowers*: calyx appressed hairy; calyx tube about 2 mm high; calyx limb 1–1.5 mm long; calyx lobes imbricate, transversely elliptic, rounded or truncate at apex, ciliate, about 0.5 mm long; corolla white, trumpet-shaped, 6–8(–10) mm long, glabrous or slightly hairy or papillose, 5-lobed, the lobes spreading, obovate to spathulate, margin papillate or ciliate; corolla tube 2–3(–5) mm long; stamens monadelphous, 30–50 in number, about 5 mm long; staminal tube adnate to corolla tube, inside glabrous, free part 1–2.5 mm long, filaments flattened, abruptly narrowed at apex forming a short whip, papillose; disk cylindrical, 0.5–1 mm long, tomentose; style papillose, glabrous, 4–6(–8) mm long; ovary semi-inferior, 2-locular with 4 ovules in each locule. *Fruits* black, ellipsoidal, sparsely pilose, 6–9 mm long 3–5 mm in diameter, crowned by persistent calyx lobes, only 1 locule developed; stones obliquely ellipsoidal, smooth, with 2 lengthwise grooves, about 6 mm long, 3 mm in diameter; mesocarp and endocarp thin; seeds 1, straight or slightly curved with straight embryo. *Pollen grains* 3-colporate, semiangular in polar view, oblate in equatorial view; tectum smooth, perforate, without supratectal processes; ektoaperture slitlike, endoaperture circular; 27.8–29.0 μm (P) × 38.0–40.2 μm (E); pollen type I. — Flowers: July–Aug. (in Japan). Fruits: Oct.–Nov.

Jap. name: Miyama-shirobai, *Rusun, Dosun.*

Habitat. Subtropical montane evergreen forests.

Chrom. numb. 2n = ca. 90.

Distr. Japan (Ryukyu), Taiwan.

JAPAN. **Ryukyu**. Kagoshima. Amami-Oshima Is.: Yuwan-dake, *G. Koidzumi* (KYO), *H. Migo* (KYO), *H. Ohba 11* (KYO), *M. Furuse 7972, 8012* (RYU); Yamato–Sumiyo, *G. Koidzumi.* Tokunoshima Is.: Inokawa-dake, *K. Iwatsuki et al. 256* (KYO), *H. Migo 26884* (KYO), *Y. Miyagi & S. Hatusima 39405* (RYU); 500–645 m, *H. Nagamasu 1762* (KYO), 430–645 m, *M. Tamura et al. 47* (KYO). — Okinawa. Okinawa Is.: *S. Sakaguchi 15* (KYO); Oku, *K. Higashi* (RYU); Nishime-dake, 350–420 m, *H. Nagamasu 2023* (KYO); Mt. Yona, *S. Hatusima 18214* (TI); Yona, 300 m, *H. Nagamasu 2021* (KYO); Sade, Benoki-gawa, *S. Sonohara 1, 2* (KYO), *M. Furuse 5034* (RYU); Sade, *G. Koidzumi* (KYO); Henoki, *T. Naito* (TI); Yonaha-dake, *F.H. Walker et al. 7018* (TI), *Y. Niiro 2261* (RYU); Udenawa-yama, Higashi-son, *T. Kaneshiro 1423* (RYU); Mt. Iyu-dake, *Y. Miyagi 5250* (RYU); Ibu-dake, *Anonymous* (KYO); Tano-dake, *Y. Niiro 3381* (RYU); Agariebaru, Nago, *T. Kaneshiro 1538* (RYU), *E. Takamine 2258* (RYU); Nago-dake, *H. Nagamasu 1664* (KYO); Nago, *E. Takamine 2055* (TNS); Nakagami, *G. Koidzumi* (KYO).

TAIWAN. without precise locality, *Anonymous 927* (TI). — Nantou: Mt. Niitaka, 7000–8000', *Kawakami & Mori 1785* (TI), *2006* (TI); Rarirari-sha, *G. Nakahara 469* (TI); Mt. Feng-shan, Chitou, 1600 m, *T. Yamazaki 149* (TI). — Kaohshiung: Daizyurinzan, *E. Matuda 12–19* (TI).

Note. The plants of Taiwan have larger flowers than those of Japan.

1-2. var. **oblonga** Nagamasu, **var. nov.**

S. confusa Brand var. *lysiostemon sensu* Hand.-Mazz., Symb. Sin. 7: 808 (1936); Beih. Bot. Centralbl. 62-B: 40 (1943), *p.p., excl. typ., Poilane 7209*(P).

S. confusa auct. *non* Brand: Y.-F. Wu, Fl. Reip. Pop. Sin. 60(2): 75 (1987).

Laminae oblongae, ellipticae ad anguste obovatae, luteo-brunneae ad brunneae in sicco, 6–11 cm longae, 2.5–4 cm latae, apice acuminatae, base attenuatae, venis primarriis (7–)8–11 paribus. Corolla 4.5–7 mm longa, tubo ca. 2 mm longo. Fructus ovoideus, pilosus, 5–6 mm longus. — Typus: *R.-C. Ching 2088* (W), between Ping Yung and Tai Suan, 500–900 m, S Zhejiang, China.

Terminal buds obliquely ovoid to subulate, 3–7 mm long. *Leaves*: blades oblong, elliptic to narrowly obovate, yellowish brown to brown when dry, 6–11 cm long, 2.5–4 cm wide; apex acuminate; base attenuate; nerves (7–)8–11-paired. *Inflorescences* 1–7-flowered. *Flowers*: corolla 4.5–7 mm long; corolla tube ca. 2 mm long; style 4–5 mm long. *Fruits* ovoid, pilose, 5–6 mm long. — Flowers: June–Aug. Fruits: Sept.–Nov.

Distr. S China, ?Indochina.

CHINA. Zhejiang: between Ping Yung and Tai Suan, 500–900 m, *R.-C. Ching 2088* (W, syntype of *S. confusa* var. *lysiostemon* Hand.-Mazz.); Tai Shun, *Y.-L. Keng 255* (A). — Fujiang: Kuliang, *H.-H. Chung 6614* (A), *6709* (A), *6727* (A); Kushan, Foochow, *H.-H. Chung 8111* (A). — Jiangxi: Tzu Chi Hsien, *H.-H. Hu 1252* (A); Oo Chi Shan, near Lam Uk Village, Lungnan Distr., *S.-K. Lau 4751* (A); Tong Ku, *Y.-K. Hsiung 6154* (A). — Guangdong: Thai Yong, W pr. the Port of Swatow, *Dalziell s. n.* (W); Mts. Tsatmukugao, Lienping, 950–1050 m, *Rud. Mell. 674* (A); Lin Fa Shan, Pak Shui Chai, Haifung Distr., *W.-T. Tsang 25490* (A); Sha Lo Shan, Lo-Lo-Ha Village, Sin-fung Distr., *Y.-W. Taam 981* (A, KYO); Yam Na Shan (Yit Nga Shan), Mei (Kaying) Distr., *W.-T. Tsang 21406* (KYO). — Guangxi: *C. Wang 39647* (A). — Guizhou: Nandjing-schan, Liping, 700 m, *H. F. Handel-Mazzetti 10986* (W).

Subgen. 2. **Hopea** (L.) Clarke
Sect. 1. **Palura** G. Don

Key to the species

1a. Bark transversely fissured; leaves ovate to elliptic, glaucous on lower surface; fruits black. ..... 5. *S. tanakana*

1b. Bark longitudinally fissured or exfoliating; leaves obovate, elliptic, oblong, or ovate, lower surface pale green but not glaucous; fruits blue, dark blue, or black.

2a. Lower surface of leaves finely reticulate, often tinged red and distinctly visible, but not prominent on lower surface; fruits black. ..... 4. *S. paniculata*

2b. Lower surface of leaves coarsely reticulate, veins more or less prominent; fruits dark blue or blue.

3a. Leaves ovate to obovate, apex acuminate to caudate, margin coarsely glandular dentate; panicles without foliage leaves; fruits dark blue. ..... 2. *S. coreana*

3b. Leaves obovate to elliptic, apex abruptly acute to acuminate, margin serrulate; panicles with a few foliage leaves; fruits blue. ..... 3. *S. sawafutagi*

2. **Symplocos coreana** (Lév.) Ohwi — Fig. 3-2, Map 2, Plate 53b–c.

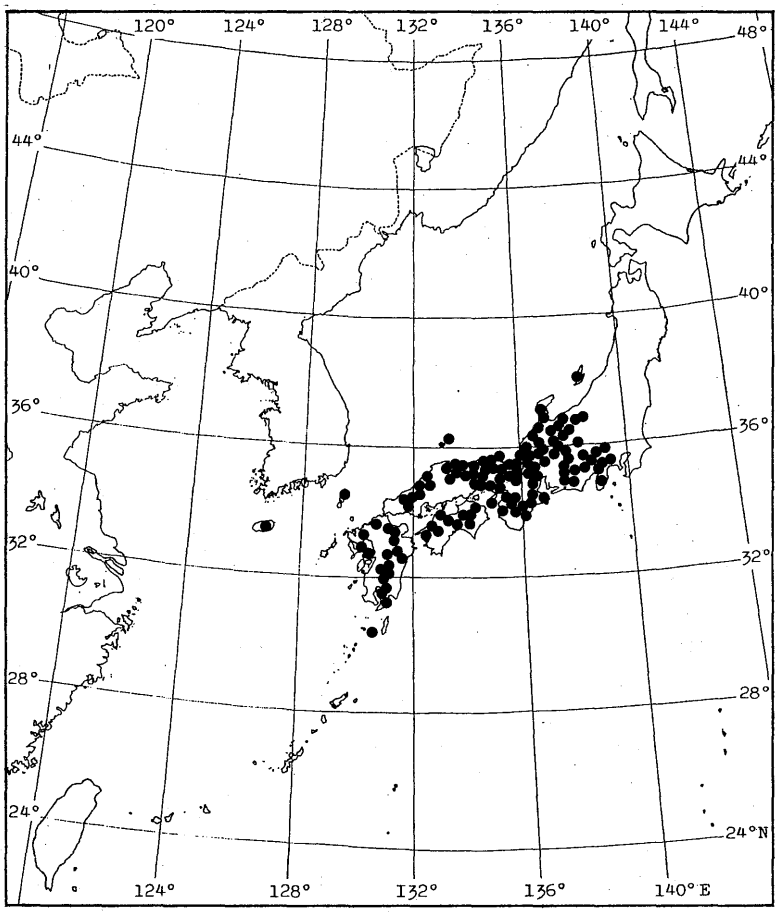
S. coreana (Lév.) Ohwi, Bull. Nat. Sc. Mus. Tokyo 33: 227 (1918); Hatusima, J. Geobot. 12: 71 (1963); Ohwi, Fl. Jap. English ed.: 725 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 95, t. 110 (1971); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 187-1 & 3 (1989). — *Cotoneaster coreanus* Lév., Fedde Repert. 11: 64 (1912). — *Palura coreana* Nakai, Bot. Mag. Tokyo 48: 773 (1934); Hara, Enum. Sperm. Jap. 1: 109 (1948). — Type: *Taquet 1106* (E!, Plate 53b), Hallaisan, 1400 m, Quelpaert, Korea.

S. argutidens Nakai, Bot. Mag. Tokyo 32: 228 (1918); Nakai, Bot. Mag. Tokyo 35: 121 (1921). — *Palura argutidens* Nakai, Tr. & Shr. 1: 231, t. 129 (1922); Fl. Sylv. Koreana 13: 35, t. 10 (1923); Tr. & Shr. ed. 2: 311, t. 145 (1927); Masamune, Fl. & Geo. Yakus.: 363 (1934). — Lectotype: *Nakai 6408* (TI!, Plate 53c), in sylvis lateris borealis, Quelpaert, Korea. (designated here).

S. papyracea Nakai, Bull. Nat. Sc. Mus. Tokyo 33: 20 (1953), *nomen, descr. in angl.*

S. paniculata auct. *non* Miq.: Franch. & Sav., Enum. Pl. Jap. 1: 308 (1875), *p.p.*; Nooteboom, Leid. Bot. Ser. 1: 258 (1975), *p. min. p.*
S. crataegoides forma *major sensu* Franch. & Sav., Enum. Pl. Jap. 2: 433 (1878), *p.p.*
S. crataegoides auct. *non* Buch.-Ham. *ex* D. Don: Brand, Pfl. R. Heft. 6: 33 (1901), *p.p.*

Deciduous trees or shrubs; bark gray-brown, longitudinally fissured or thinly exfoliating. Twigs gray-brown, glabrous or sometimes hairy. Buds brown, with glabrous or puberulous scales, the margin ciliate. *Leaves*: blades papery, ovate to obovate, 4–8 cm long, 2–5 cm wide; apex acuminate to caudate, base cuneate to rounded, margin ciliate and coarsely glandular dentate with teeth curved upward; upper surface glabrous or rarely appressed hairy; lower surface pilose especially on sides of midrib and nerves; midrib impressed on upper surface, prominent on lower surface; nerves 5–7 pairs, prominent on lower surface; reticulation coarse; petioles 3–7 mm long, abaxially glabrous. *Inflorescence* a panicle, 4–8 cm long, the axis pilose on one side to villose or glabrous; bracts and bracteoles linear, ciliate,



Map 2. Distribution of *Symplocos coreana* (Lév.) Ohwi.

glandular dentate, 1 mm long, soon caducous; pedicels slender 0–3(–5) mm long. *Flowers*: calyx tube glabrous or pilose, 1–1.5 mm high; calyx lobes imbricate, pilose or glabrous, elliptic to narrowly ovate with ciliate margin, ca. 1 mm long; corolla white, deeply 5-lobed, 3–4 mm long, lobes elliptic, short ciliate on margin; stamens 25–40, pentadelphous; disk 5-glandular, glabrous or hairy, if hairy the calyx tube also hairy; style 2–3 mm long, glabrous; ovary 2-locular, with 4 ovules in each locule. *Fruits* bluish black, globose to obliquely ovoid, 6–7 mm in diameter, crowned by the persistent calyx lobes; mesocarp thin; seed 1, reniform, with copious endosperm and curved embryo. *Pollen grains* 3-colporate, angular to semiangular in polar view, oblate in equatorial view; irregularly suprareticulate; ora slit-like; 19.3 μm (P) × 29.2–33.2 μm (E); pollen type IIa. —Flowers: June. Fruits: Sept.–Oct.

Jap. name: Tanna-sawafutagi

Habitat. Temperate deciduous forests, often on ridges or on mountain slopes.

Distr. Japan (Honshu, Shikoku, Kyushu), Korea (Jeju Is.)

JAPAN. **Honshu**. Tokyo: Nippara, Nishitama-gun, *H. Aoki 2046* (TI); Karikurayama, Nishitama-gun, *M. Mizushima* (TI); Kori-mura, 300–800 m, *M. Mizushima 2336* (TI); Hikawa, Gozen-yama, 700 m, *T. Yamazaki 170* (TI); Musashi-otake, *F. Maekawa* (TI); Hichiishi-dani, Okutama, *H. Kanai 2838* (TI). —Kanagawa: Mt. Oyama, *M. Hashimoto* (TI); Hakone, *I. Hurusawa 1483* (TI), *T. Sawada 2155* (TI), *F.G. Greatrex* (TI). —Niigata: Sado Is.: *Faurie 2548* (KYO), *H. Muramatsu* (TI); Ogawa, *Y. Ikegami* (TI); Aikawa, *Y. Ikegami 419* (TI), *M. Honda* (TI). —Toyama: along Katakai-gawa, Uozu-shi, *K. Nagai* (KYO); Kamiichi, Nakaniikawa-gun, *N. Kurosaki 1687* (KYO); Kanetsuri-onsen, Kurobe, *J. Ohwi 7501* (KYO); Muraki, Himi-shi, *H. Takano 994* (KYO); Tochiya, Unazuki-cho, 100 m, M. *Nagai 105* (TI); Nakagochi, *N. Satomi* (TI). —Ishikawa: Mt. Sekido, Kashima-gun, *N. Fukuoka 3099* (KYO); Kanazawa, *T. Sawada* (KYO, TI); Yuwaku-onsen, *H. Hara* (TI); Mt. Iozen, *K. Honda* (KYO); Tatsunokuchi, Nomi-gun, *Y. Sugie* (KYO); Mt. Hakusan, Shiramine-mura, 1200 m, *H. Koyama 1884* (KYO); Mt. Fujishaga, Enuma-gun, *N. Fukuoka 1924* (KYO); Monzen-cho, Hoshi-gun, *Y. Matsuoka* (TI); Mt. Kuragatake, *H. Hara* (TI). —Fukui: Toritate-yama, Katsuyama-shi, 1200 m *S. Watanabe 18414* (KYO); Mt. Arashima-dake, 600 m, *S. Watanabe 17156* (KYO); Hinoyama, Takefu-shi, *S. Watanabe 16370* (KYO); NW of Yashagaike, Nanjo-gun, 250–400 m, *N. Fukuoka & Y. Inamasu 328, 365* (KYO); Kuroka-gawa, Tsuruga-shi, 400–500 m, *N. Kurosaki 6371* (KYO, TI); Mikuni-dake, Nadasho-mura, 550 m, *S. Watanabe 19183* (KYO); Ito-mura, *M. Maeda* (TI). —Yamanashi: Matsuhime-tohge, Otsuki to Kosuge, *H. Taoda 3813* (KYO); Shinmisaka-tohge, *H. Kanai* (TI); Motosuko, Kyugatake-rindo, *H. Kanai* (TI); Kenashiyama, Kamiide-mura, Fuji-gun, 1300 m, *H. Kanai* (TI); Abe-tohge, *K. Hisauchi 2572* (TI); Aoki-kosen, Mts. Ho'o, 1100 m, *F. Kimura* (TI). —Nagano: Okuwa-mura, Nishichikuma-gun, 780–1100 m, *J. Murata 7778* (TI); Togakushi, Hokosha, 1000 m, *K. Midorikawa 1994* (TI); Nagata-mura, Shimominochi-gun, *M. Mizushima 2900* (KYO), *11676* (TI); Izuna, *M. Togashi* (TI); Iizuna-kogen, 1000 m, *M. Ito 203* (KYO); Maruyama, Shimoina-gun, 1300 m, *T. Yamazaki* (TI); Omachi, Sangaku-hakubutsukan, 700 m, *H. Kanai* (TI); Morigami, Kitashiro-mura, Kitaazumi-gun, *F. Yamazaki* (TI); Nakabusa to Ariake, *S. Momose* (TI); Tsuta-onsen, Takase-gawa, Kita-Alps, 800 m, *H. Kanai* (TI); Suwa, *H. Tobita* (KYO); Taruzawa-kokuyurin, Otaki-mura, *M. Mizushima* (TI); Agematsu, Kiso, *K. Hisauchi* (TI). —Gifu: Mt. Genjidake, Takayama-shi, 600–900 m, *N. Fukuoka 7466* (KYO); Dangumi to Mt. Funagawa, Ono-gun, *N. Fukuoka 7537, 7549* (KYO); Exp. Forest of Gifu Univ., Mashita-gun, 800–900 m, *H. Takahashi 1936, 2225* (KYO); Shioya, Sakaide-mura, Yoshiki-gun, *H. Kanai*; Hogogaike, Ena-shi, 650 m, *G. Murata & H. Nishimura 96* (KYO); Hirugano, 890 m, *G. Murata 14438* (KYO); Mt. Dainichi-dake, Gujo-gun, *H. Nishimura & K. Ueda* (KYO); Mt. Funabuse, Yamagata-gun, *H. Takahashi 5368* (KYO); Nogohakusan, Neo-mura, 900 m, *H. Takahashi 2007* (KYO); Osaidani, Kasuga-mura, Ibi-gun, 600–900 m, *H. Takahashi 185* (KYO); Mt. Ena, *H. Kanai* (TI); Yoro-notaki, *H. Kanai* (TI). —Shizuoka: Umegashima spa to Abetoge, *H. Ohashi & J. Murata 1864* (TI); Sasazuka, Mt. Fuji, 1500 m, *B. Hayata* (TI); Ashitakayama, Hosogiridake, *H. Kanai 7353* (TI); Osawa, *H. Kanai 7329* (TI); Jokojiyama, Iwata-gun, 1100 m, *T. Yamazaki* (TI); Ryusozan, *J. Sugimoto*; Kurata, Setonotani-mura, *D. Shimizu 239* (TI); Amagi-tohge, Izu, 800 m, *H. Ohba et al. 7005* (KYO, TI); Mt.

Amagi, *Ito* (TI), *T. Sawada 859* (TI). — Aichi: Chausu-yama, Toyone-mura, Kitashitara-gun, 1300–1415 m, *H.T. Im 3140* (TI); Motomiya-yama, Minamishitara-gun, *Y. Momiyama* (TI); Kawai, Miwa-mura, *K.Torii 8945* (TI); Zenbu, Tsukude-mura, *K. Torii* (KYO). — Mie: Mie Univ. Exp. Forest, Yahata-mura, 700 m, *H. Kanai 6821* (TI); Mt. Kuruson, Taro-mura, Isshi-gun, 900 m, *H. Kanai* (TI); Shinchayanoike, Akeno, Obata-cho, *C. Chyuma*; Mt. Gozaisho, *G. Nakai 4636N* (KYO), 600–800 m, *N. Fukuoka 5933* (KYO); Nagano-mura, Minamimuro-gun, *T. Nakajima* (TI); Osugidani, Hinodedake-Momonoki, 1300 m, *T. Yamazaki et al.* (TI); Momonoki to Odaigahara, *M. Hiroe 7282* (TI), *7289* (KYO); Yamawa-tohge, Kumano-shi, *T. Koike 253* (KYO). — Shiga: Makino, Takashima-gun, *H. Kanai* (TI); Kutsuki-mura, 200 m, *H. Ohashi et al. 8555* (TI); Mt. Ibuki, *C. Hashimoto 11052* (TI), 280 m, *T. Shimizu 453, 457* (KYO); Busshoji-cho to Ouri-cho, Hikone-shi, 400–600 m, *M. Ito 7001* (KYO); Mt. Mikuni-yama, Makino-cho, *G. Murata 20250* (KYO); Katsurakawa, Shiga-gun, *G. Koidzumi* (TI); Mt. Hira, 1000–1200 m, *G. Murata 19009* (TI); Mt. Hiei, *H. Yamamoto* (TI). — Kyoto: Mt. Taiko-yama, Yasaka-cho, Takeno-gun, *K. Nagai 25085* (KYO); Mt. Ryugatake, Kitakuwata-gun, *H. Yamamoto 281* (TI); Tauta, Miyama-cho, *Y. Tateishi & J. Murata 4157* (KYO, TI); Ashiu, Kitakuwata-gun, *H. Nagamasu 2063, 2064, 2070* (KYO); Mt. Chorogatake, Funai-gun, *G. Nakai 4186* (KYO), *H. Yamamoto 1565* (TI); Ruri-kei, Funai-gun, *G. Koidzumi* (KYO); Mt. Kumotori, Keihoku-cho, 700–920 m, *H. Nagamasu 150*, (KYO); Seryo-tohge, *T. Takahashi* (TI); Hanase-mura, Atago-gun, *Y. Momiyama 607* (TI); Ponpon-yama, Otokuni-gun *H. Yamamoto 165* (TI); Oharanomura, Otoguni-gun, *G. Murata 13339* (KYO); Iwakura, Kyoto-shi, 180 m, *M. Umebayashi 989* (KYO). — Osaka: Mt. Katsuragi-san, Izumi, 600 m, *G. Murata 11344* (KYO); Mt. Iwawaku-yama, *Yamaguchi* (KYO); Mt. Kongo-san, *T. Nakai* (TI); Sakai, *Ui 59* (TI). — Hyogo: Mt. Oginosen, Onsen-cho, 920–1100 m, *N. Kurosaki 12696* (KYO); Mt. Suganosen, *N. Fukuoka & Y. Inamasu 703* (KYO); Dainichidake, Kinosaki-cho, *Z. Tashiro* (KYO); Mt. O'okayama, Kinosaki-gun, *N. Fukuoka 12382* (KYO); Mt. Hyonosen, *G. Koidzumi* (KYO); Mt. Kogane-dake, Sasayama-cho, 500–700 m, *N. Kurosaki 14752, 14753* (KYO); Mt. Mino-san, Shingu-cho, Ibo-gun, 300–400 m, *N. Fukuoka 9149* (KYO); Kamiso-cho, Kakogawa-shi, 20–60 m, *N. Kurosaki 6855* (KYO); Takarazuka-shi, 250–350 m, *N. Fukuoka & N. Kurosaki 2506* (KYO); Mt. Rokko, *G. Koidzumi, Z. Tashiro* (KYO); Mt. Yuzuruha-san, Awajishima Is., *N. Satomi 10178* (TI); Koyoen, Nishinomiya-shi, *N. Kurosaki 6297* (TI). — Nara: Mt. Kongo-san, 1100 m, *S. Okamoto 13421* (KYO); Nosegawa-mura, Yoshino-gun, *G. Koidzumi* (KYO); Mt. Omine, 1000–1900 m, *M. Hiroe 12853* (KYO), *N. Fukuoka & M. Hotta 131* (KYO), *H. Okada 1542* (KYO); *Y. Tateishi & J. Murata 4242* (TI); Kariyasu-one, Totsukawa-mura, *M. Ito 293* (KYO). — Wakayama: Arida, *S. Okamoto 19245, 19246* (TI). — Tottori: Mt. Oginosen, Iwami-gun, *A. Tanaka 20618* (KYO); Mt. Hyonosen, Yazu-gun, *A. Tanaka 11563* (KYO); Mt. Nagi-san, Yazu-gun, *A. Tanaka 25184* (KYO); Kitadani, Saji-mura, Yazu-gun, 600–1000 m, *G. Murata et al. 319* (KYO); Misasa-machi, Tohaku-gun, 500 m, *S. Ishizawa 17232* (KYO); Nakayama-cho, Saihaku-gun, *A. Tanaka 15914* (KYO); Mt. Daisen, *Faurie 3498* (KYO); Mt. Kenashiyama, Hino-gun, *A. Tanaka 13011* (KYO). — Shimane: Akaya-mura, Nogi-gun, *T. Hiroe 977* (KYO); O'etakayama, Nima-gun, *S. Takagi 210* (KYO); Mt. Sanbe, *T. Sawada* (TI), *K. Midorikawa 2257* (TI); Asayama, Ichiki-mura, Ochi-gun, 900 m, *H. Kanai*; Kamedake-mura, Nita-gun, *N. Satomi 42* (TI); Nakamura, Saigo-cho, Oki Is., *K. Deguchi & S. Tsugaru 3770* (KYO). — Okayama: Okutsu-mura, Tomata-gun, *S. Kajiya* (KYO); Mt. Nakahiruzen, Maniwa-gun, 800–900 m, *M. Hiroe 16396* (KYO). — Hiroshima: Nakatsudani, Yoshiwa-mura, 900 m, *H. Hara & S. Kurosawa*; Mt. Kanmuri, Yamagata-gun, *M. Hiroe 7743* (KYO); Sandan-kyo, Yamagata-gun, *S. Suzuki* (KYO); Togouchi-machi, Yamagata-gun, *T. Makino 156527* (KYO); Mt. Tenguishi, Geihoku-cho, 1190 m, *K. Ueda 709* (KYO). — Yamaguchi: Aradani, Yoshiki-gun, *T. Goya 19* (TI); Jakuchi-zan, Kuga-gun, *T. Oda 2766* (KYO), *J. Nishina 2803* (TI); Takane-mura, Kuga-gun, *M. Wada 4011* (KYO); Chojagahara, Tokuji-cho, Saba-gun, *K. Oka 22794* (TI), *22795* (KYO); Sasanami-mura, Abu-gun, *J. Nishina 439* (TI); Tokusa, Ato-cho, Abu-gun, *T. Oda 2392* (KYO); Kogushi, Toyoma-gun, *S. Yoshioka 7* (TI). **Shikoku**. Tokushima: Mt. Nakatsu-san, Miyoshi-gun, 1000 m, *G. Murata 7739, 7743* (KYO); Mt. Takagoshiyama, *Z. Tashiro* (KYO); Mt. Otakisan, Mima-gun, 900 m, *M. Takahashi 1089* (KYO); Mt. Tsurugi-san, *J. Nishina 2289* (TI), 1500–1900 m, *M. Hiroe 13403* (KYO); Kuwadaira to Myoto-ike, Ichiu-mura, Miuma-gun, *M. Hotta 10804* (KYO). — Kagawa: Miki-cho, Nakayama–Otakiji, Kida-gun, *H. Kanasaki* (TI); Mt. Otakisan, 550 m, *M. Hiroe 15613* (KYO), 950 m, *H. Nagamasu & M. Takahashi 1791* (KYO). — Ehime: Mt. Kurotaki-san, Tokuda-mura, Shuso-gun, *H. Yamamoto* (KYO); Mt. Ishizuchi, *M. Hiroe 12063, 12066* (KYO), *R. Kubo* (TI); Omogokei, Kamiukena-gun, 1300 m, *H. Takahashi 3419* (KYO); Nakahama-cho, Kita-gun, 820 m, *Y. Nomura 13* (KYO); Onogahara, Shirokawa-cho, Higashiura-gun, *N. Fujita & E. Miki 154* (KYO); Soto'obara, Uwa-cho, 230 m, *S. Yamamoto 20232* (KYO). — Kochi:

Mt. Hozo-san, Umaji-mura, Aki-gun, *M. Tagawa* (KYO); Jinkichi-mori, Aki-gun, *M. Tagawa* (KYO); Zinsenji to Shii-tohge, N of Kochi-shi, *G. Murata & T. Shimizu* 1195 (KYO); Monobe-mura, Kami-gun, *Y. Momiyama t-270* (TI); Nanokawa, Agara-gun, *K. Watanabe* (TI). **Kyushu**. Fukuoka: Mt. Inugatake, 1000 m, *M. Hotta 6176* (KYO); Mt. Hikosan, *M. Togashi 7376* (TI). — Saga: Mt. Tenzan, *T. Baba* (TNS); Mt. Tara-dake, *T. Yamazaki* (TI), 600–983 m, *H.-T. Im 2234* (KYO). — Nagasaki: Mt. Unzen, *F.C. Graetrex 118, 119a* (TI), 1100 m, *S. Toyama* (TI); Tsushima Is., Mt. Mitake, *Z. Tashiro* (KYO), Toyozaki-mura, *I. Haratomo* (KYO), Mt. Mokkoku–Mt. Terata, Shimoagata, 500 m, *H. Ohashi & H. Soma* (TI), Yatateyama, *Y. Yabe* (TI), Anagizaka, *T. Nakai* (TI). — Kumamoto: Kukino-mura, Aso-gun, 600 m, *Y. Shimada 13435* (KYO); Mt. Noke'eboshi, Kuma-gun, *K. Maebara 591* (KYO); Mt. Shiraga, Itsuki-mura, *K. Maebara K582* (KYO); Mt. Ichifusa, *Z. Tashiro* (KYO). — Oita: Mt. Hiko-san, *N. Ida 341* (KYO); Karan-san, Usa-shi, *Z. Tashiro* (KYO); Mt. Kujiu, *S. Kitamura* (KYO); Mt. Haneyama, Kusu-gun, *K. Ikebe* (KYO); Mts. Sobo-Katamuki, Shirouzu to Oshoji, 700–1500 m, *J. Murata* (TI). — Miyazaki: Mt. Okue, Sanrigawara, 1300 m, *S. Hatusima & S. Sako 24987* (KYO), *N. Fujita & M. Kato 403* (KYO, TI), Obiragoe, 1200 m, *J. Murata 7940* (TI); Kitakata-mura, Higashiusuki-gun, 1100 m, *M. Hotta 6362* (KYO); Shiiba, 1000–1100 m, *H. Kanai* (TI); Omae to Mt. Kurumi, Shiiba, 1300 m, *M. Hotta 6539* (KYO); Mt. Osuzu, Togo-mura, 1200–1300 m, *H. Kanai* (TI); Mt. Kirishima, *T. Yamazaki* (TI), *H. Muramatsu* (TI), Karakuni-dake, 1400–1500 m, *H. Koyama 7537* (KYO). — Kagoshima: Mt. Kirishima, *Z. Tashiro* (KYO); Kokubu, Aira-gun, *Z. Tashiro* (KYO); Mts. Takakuma, 1150 m, *S. Noshiro & M. Suzuki 4850* (TI); Mt. Bishago, Tarumizu-shi, 800 m, *S. Hatusima 19819* (KYO); Mt. Hoyoshi-dake, *Y. Momiyama* (TI); Yakushima Is., 900–1930 m, *G. Koidzumi* (KYO), *Z. Tashiro* (KYO), *M. Tagawa 1931* (KYO), *K. Iwatsuki et al. 39* (KYO), *G. Murata & H. Tabata 408, 497* (KYO), *K. Okada & A. Takahashi 3059* (KYO), *T. Yamazaki et al. 2063, 2120* (TI), *T. Yahara et al. 6030, 6072, 6073* (TI), *7532* (KYO).

KOREA. Jeju-do: *Faurie 2137* (KYO), *H.-D. Chang 1581* (KYO), *T. Nakai 6408, 6409* (TI), *Faurie 2137* (TI); Hallaisan, *Taquet 1106* (E), *Faurie 1891 p.p.* (KYO), *T. Nakai* (TI).

Note. In Hokuriku district, a dwarf form of this species is often observed, which is probably due to deep snow in winter in this region.

3. **Symplocos sawafutagi** Nagamasu, **nom. nov.** — Fig. 3-3 & 4j, Map 3, Plate 53d, 54a.

S. sawafutagi Nagamasu — *Palura paniculata* (Thunb. *ex* Murray) Nakai var. *pilosa* Nakai, Tr. & Shr. ed. 2: 309, t. 144 (1927), *descr. in japon.* — *P. ciliata* Nakai *ex* [H. Ito, Bot. Mag. Tokyo 47: 897 (1933), *nom. nud.*] Hara, J. Jap. Bot. 10: 322 (1934). — *P. chinensis* (Lour.) Koidz. var. *pilosa* Nakai, Bot. Mag. Tokyo 48: 774 (1934). — *P. pilosa* Nakai *ex* Honda, Nom. Pl. Jap.: 274 (1939), *nomen nud.* — *S. chinensis* (Lour.) Druce forma *pilosa* Ohwi, Bull. Nat. Sc. Mus. Tokyo 33: 83 (1953); Fl. Jap. English ed.: 726 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 95, t. 111 (1971); Murata in SAtake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 187-4 65 (1989). — *S. chinensis* subsp. *pilosa* M. Kitagawa, Neo-Lineam. Fl. Manshur.: 509 (1979). — Type: *Anonymous s. n.* (TI!, Plate 53d), 11 May 1878, Shirako, Japan.

S. paniculata (Thumb. *ex* Murray) Miq. var. *leucocarpa* Nakai, Bot. Mag. Tokyo 32: 227 (1918). — *Palura paniculata* var. *leucocarpa* Nakai, Fl. Sylv. Koreana 13: 33 (1923); Tr. & Shr. ed. 2: 310 (1927). — *S. crataegoides* var. *leucocarpa* Makino & Nemoto, Fl. Jap. ed. 2: 98 (1931). — *P. chinensis* var. *pilosa* forma *leucocarpa* Nakai, Bot. Mag. Tokyo 48: 774 (1934). — *P. pilosa* forma *leucocarpa* Nakai *ex* Honda, Nom. Pl. Jap.: 274 (1939), *nom. nud.* — *P. chinensis* var. *leucocarpa* Hara, Enum. Sperm. Jap. 1: 108 (1948). — *S. chinensis* var. *leucocarpa* Ohwi, Bull. Nat. Sc. Mus. Tokyo 33: 83 (1953); Ohwi, Fl. Jap. English ed. 725 (1965). — Type: *Nakai 6074* (TI!, Plate 54a), in colle Chang-zen, Corea Orient.

S. sinica auct. *non* Ker: Miq., Prol. Fl. Jap.: 267 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 309 (1874), *p.p.*; *op. cit.* 2: 433 (1879), *p.p.*; Matsumura, Ind. Pl. Jap. 2(2): 488 (1912), *p.p.*

S. paniculata var. *typica* sensu Nakai, Bot. Mag. Tokyo 32: 227 (1918).

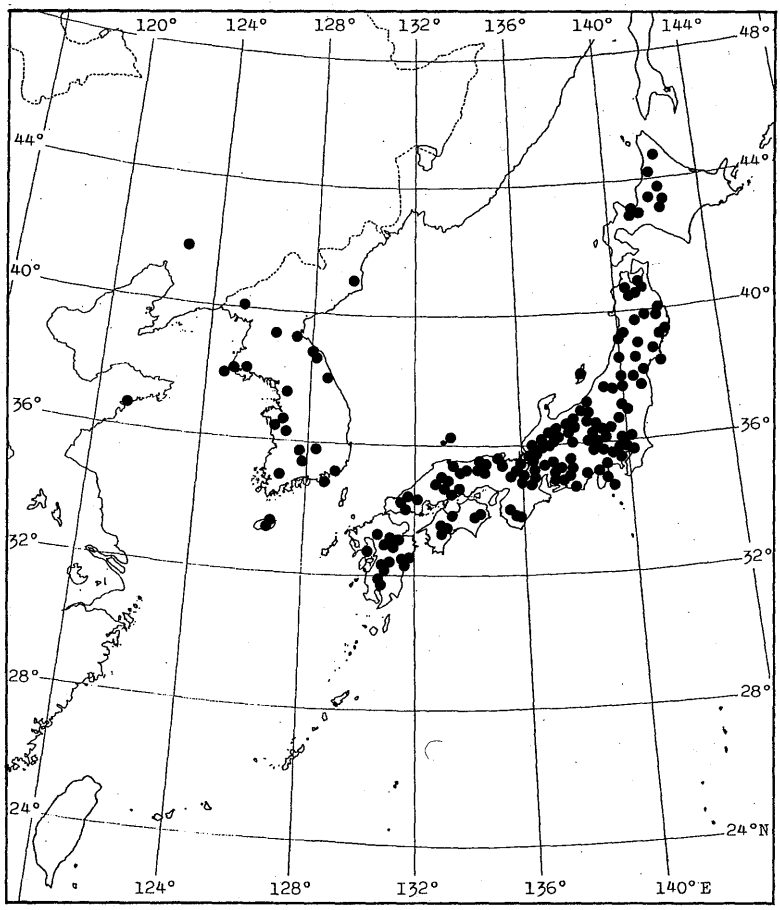
Palura chinensis sensu Koidzumi, Bot. Mag. Tokyo 43: 397 (1929).

S. chinensis auct. *non* (Lour.) Druce: Hatusima, J. Geobot. 12: 71 (1963).

S. paniculata auct. *non* (Thunb. *ex* Murray) Miq.: Hand.-Mazz., Beih. Bot. Centralbl. 62B: 39 (1943); Nooteboom, Leid. Bot. Ser. 1: 258 (1975); Wu, Fl. Reip. Pop. Sin. 60(2): 72 (1987).

S. crataegoides auct. *non* D. Don: Miq., Prol. Fl. Jap.: 267 (1867); Brand, Pfl. R. Heft 6: 33 (1901); Matsumura, Ind. Pl. Jap. 2(2): 486 (1912).

Deciduous shrubs; bark gray-brown, irregularly exfoliating. Twigs green to gray-brown, ciliate on one side to villose, or rarely glabrous. Buds gray-brown, with puberulous or glabrous scales with ciliate margin. *Leaves*: blades papery, obovate to elliptic, 3–8(–12) cm long, 1.5–4(–6) cm wide, apex abruptly acute to acuminate, sometimes rounded or shortly caudate, base cuneate, margin ciliate and glandular serrulate, the teeth incurved; upper surface sparsely hairy; lower surface pale green, sometimes glaucous, hairy especially on midrib and nerves, sometimes glabrescent; midrib impressed on upper surface, prominent on lower surface; nerves 5–7 pairs, prominent on lower surface; reticulation coarse; petioles 3–7 mm long. *Inflorescence* a cylindrical panicle, 2–6(–8) cm long, often one or two foliage leaves are scattered in the panicle, and the axillary branches of the panicle often concaulescent, the axis pilose on one side to villose, rarely glabrous; bracts and bracteoles linear, ciliate, 0.5–2



Map 3. Distribution of *Symplocos sawafutagi* Nagamasu.

mm long, soon caducous; pedicells slender, 0–6 mm long. *Flowers*: calyx tube glabrous or pilose, 1–1.5 mm high; calyx lobes imbricate, glabrous or sparsely pilose, elliptic to narrowly ovate with ciliate margin, 1–1.5 mm long; corolla white, 3–4 mm long, deeply 5-lobed with shortly ciliate margin; stamens 25–40, pentadelphous; disk 5-glandular, glabrous or pilose, if pilose the calyx tube also hairy; style 2–3 mm long, glabrous; ovary 2-locular, with 4 ovules in each locule. *Fruits* blue or rarely white, obliquely ovoid, 6–7 mm long, 5–6 mm in diameter, crowned by the persistent calyx lobes; mesocarp thin; seeds 1, reniform with copious endosperm and curved embryo. *Pollen grains* 3(–4)-colporate, angular to semilobate in polar view, oblate in equatorial view; tectum irregularly suprareticulate; ora slit-like; 19.4–20.5 μm (P) × 30.1–32.2 μm (E); pollen type IIa. —Flowers: May–June. Fruits: Sept.–Oct.

Jap. name: Sawafutagi

Habitat. Temperate deciduous forests, usually on alluvium in shaded places along streamlets.

Distr. Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korea, NE China.

JAPAN. **Hokkaido**. Rumoi: Kasambetsu Forest Office, Tomamae-cho, *T. Hamaya 6806d* (TNS). —Kamikawa: Kamiotoineppu, Nakagawa-gun, *G. Koidzumi* (KYO); Mt. Yubari-dake, *Akiyama 121* (TI); Kamuikotan, *K. Miyabe* (TI); Mt. Ashibetsu, 350–750 m, *G. Murata & T. Yahara 37722* (KYO). —Sorachi: Mt. Minamishokanbetsu-dake, 600 m, Uryu-cho, *G. Murata et al. 38675* (KYO), 500–700 m, *S. Tsugaru 4960* (KYO). —Ishikari: Nopporo-shinrin-koen, Ebetsu-shi, 50 m, *H. Takahashi 6198* (TI); Asari pass, Asari–Jozankei, *S. Kurosawa & Y. Tateishi* (KYO, TI). —Shiribeshi: Ranshima, Otaru-shi, near sea shore, *K. Deguchi 4395* (KYO). **Honshu**. Aomori: Eboshi-dake, Kamikita-gun, *K. Hosoi 2212* (TI); Natsudomari, Higashitsugaru-gun, *K. Hosoi* (TI); Mt. Hakkoda, the summit, *Faurie 867* (KYO), Yachi-onsen, 900 m, *T. Yamazaki et al.* (KYO, TI); Towada lake, Namari-yama, *Sato* (TI); Mt. Iwaki, *S. Kitamura* (KYO); Karekidaira, Iwaki-cho, Nakatsugaru-gun, *K. Mimoro et al. 3868* (KYO). —Iwate: Kamikasshi, Mt. Goyo-zan, 1000 m, *H. Koyama & M. Hotta 2214* (KYO); Osaki, Kamaishi-shi, 100 m, *H. Koyama 2484* (KYO); Hayachine, *U. Faurie 13122* (KYO); Mt. Ureira, Iwaizumi, 50 m, *T. Shimizu 1811* (KYO); Akka-mura, Shimohei-gun, 300 m, *T. Shimizu 2087* (KYO); Mizusawa, Ichinoseki, *Y. Chiba 37* (TI); Osukeyama, Shizukuishi, *K. Sugawara et al.* (KYO, TI); Okita-mura, Higashiiwai-gun, *K. Hosoi* (TI). —Miyagi: Sadayoshiguchi, Hunagata-yama, *H. Hara* (TI); Motogoya, Mt. Daito, *H. Ohashi 3092, 3240* (TI); Sendai, *Faurie 2256* (KYO); Kinkazan, *Faurie 5096* (KYO), *G. Koidzumi* (KYO); Mt. Fubo-dake, Shiraishi-shi, 900–1700 m, *H. Nishimura 866* (KYO); Mt. Zao, *Y. Momiyama 1704* (TI). —Akita: Tashiro-cho, Kitaakita-gun, *T. Makino* (MAK); Kuroyu, Senpoku-gun, *K. Mori* (MAK). —Yamagata: Fukura, *S. Muramatsu 65* (KYO), *Ohashi 6636* (TI); Mt. Chokai, Unodai to Osawa-jinja, 500–800 m, *N. Kurosaki 3301* (KYO); Mt. Gassan, *T. Yamazaki* (TI); Komatsu, Kawanishi-cho, Higashiokitama-gun, *K. Deguchi 3401* (KYO); Oyama-kokuyurin, Nishitagawa-gun, *K. Mori* (TI). —Fukushima: Sotoba pass, Sohma-shi, *S. Noshiro 4908* (KYO); Hibara, Kitashiobara-mura, Yama-gun, *K. Deguchi et al. 3614* (KYO); Mt. Azuma, *G. Koidzumi* (TI); Mt. Asakusa, Tadami-mura, 600 m, *T. Yamazaki 6555* (TI); Tadami-machi, Minamiaizu-gun, *E. Kinoshita 701* (KYO); Hinoemata, Minamiaizu-gun, *J. Ohwi & M. Tagawa* (KYO); Oze, *M. Mizushima 134* (TI), *D. Hoshi* (KYO). —Ibaraki: Shimotsuma, *Anonymous 36* (MAK); Mt. Tsukuba, *I. Hurusawa* (TI), *S. Kishida* (TI); Tsuchiura, *Iizuka* (MAK). —Tochigi: Sandogoya-onsen, Nasu-gun, 1100 m, *M. Mizushima* (TI); Nikko, *M. Honda, M. Mizushima 2042* (KYO), *2347* (TI); Kasamatsu-yama, Kawachi-gun, *C. Stowe* (TI); Ochiai-cho, Kamitsuga-gun, *C. Stowe* (TI); Fujiwara-cho, Shioya-gun, *H. Kanai* (TI); Mt. Kamongatake, Mts. Haruna, *N. Fukuoka 7389* (KYO). —Gunma: Tataranuma, *K. Hisauchi 1705* (TI); Kitakaruizawa, 1120 m, *T. Yahara et al. 6830* (TI); Mt. Akagi, 1500 m, *M. Nishida 666* (TI); Mt. Myogi, *M. Honda* (TI); Mt. Haruna, *T. Sawada* (TI); Yubiso-gawa, *H. Kanai* (TI); Tsumagoi-mura, *T. Enomoto 2528* (TI); Arafune, *K. Sato 224* (TI); Tanigawa-dake, Ichinokura-sawa, *T. Yamazaki* (TI); Naramata-gawa, 1000 m, *H. Matsuda* (TI). —Saitama: Urawa, *T. Koyama 451* (KYO); Nobidome, Kitaadachi-gun, *H. Ohashi* (TI); Higashiagano-mura, Iruma-gun, *M. Mizushima 11091* (TI); Kamafuse-yama, Chichibu-gun, *S. Kurosawa 10972* (TI). —Chiba: Tsuchi, Kashiwa-shi, *H. Ohba 662777* (TI); Shiroishi-

machi, Inba-gun, 20 m, *H. Ohba et al. 66* (TI); Sonno, Chiba-shi, *H. & M. Ohba 79426* (TI); Konodai, Ichikawa-shi, *T. Tuyama* (TI). — Tokyo: Mitaka, *M. Mizushima 1731* (TI); Oizumi, Kitatama-gun, *H. Kanai* (TI); Haramachida, Minamitama-gun, *T. Yamazaki 26* (TI). Izu-oshima Is.: Okadamura, *M. Mizushima* (TI); Yuba, *N. Satomi 8990* (TI). — Kanagawa: Daigatake, Hakone, *Sawada* (TI); Sengokuhara, 650 m, *N. Kurosaki 3448* (KYO). — Niigata: Shimodago, Minamikambara-gun, *T. Nagai* (KYO); Oyu to Komanoyu, Yunotani-mura, Kitauonuma-gun, 300–400 m, *S. Kitamura & G. Murata 2744* (KYO); Tsuchitaru to Yomogi pass, Yuzawa-cho, Minamiuonuma-gun, *E. Miki 2108* (KYO); Mt. Kurohime, Nishikubiki-gun, *T. Shimizu 154, 166* (KYO); Mt. Yoneyama, S of Kashiwazaki, *N .Fukuoka 1837* (KYO); Suginosawa-mura, Nakakubiki-gun, *M. Togashi TNS1238* (KYO, TNS). Sado Is.: *Faurie 2511* (KYO); Mt. Donden to Mt. Kongo, 800–900 m, *M. Okamoto 2430* (KYO). — Toyama: Kanezuruonsen, Kurobe, *J. Ohwi 7486* (KYO); Kamiichi-machi, Nakaniikawa-gun, *N. Kurosaki 1839, 2161, 2320* (KYO); Tateyama-onsen–Fujihashi, *Z. Tashiro*; Ainokura–Kaguma-toge, Taira-mura, Higashitonami-gun, 300–600 m, *G. Murata 30053* (KYO). — Ishikawa: Ushirotakayama, Ishikawa-gun, *N. Satomi* (KANA, KYO); Yokodani-tohge, Kanazawa, *N. Satomi 13260* (KANA); Mt. Iozen, *H. Furuike 23747* (KANA); Itinose, Mt. Hakusan, *G. Masamune 8724* (KANA); Tatsunokuchi-machi, Nomi-gun, *G. Masamune* (KANA). — Fukui: Nakaryu, Izumi-mura, 600 m, *S. Watanabe 17191* (KYO); Hatogayu to Karikomi-ike, Ono-shi, *N. Fukuoka 461* (KYO); Mt. Arashima, 1200 m, *G. Murata et al. 67066* (KYO); Mt. Kyogatake, Ono-shi, 900 m, *G. Murata & T. Shimizu 386* (KYO); Bushiyama, Ono-gun, *G. Koidzumi* (KYO); Mt. Kanmuri, Ikeda-cho, Imadate-gun, 1100 m, *G. Murata et al. 67261* (KYO); Yashagaike, Imajo-cho, Nanjo-gun, 1100 m, *G. Murata et al. 67180* (KYO); Ikenokochi, Tsuruga-shi, *H. Takahashi 1664* (KYO). — Yamanashi: Daibosatsu, *Y. Terauchi 6890* (KYO); Mt. Yatsugatake, Kiyosato, *F. Yamazaki* (KYO); Yamanaka, Minamitsuru-gun, 1000 m, *N. Fukuoka 7311* (KYO); Mt. Ho'o-san, Takanota, 900 m, *T. Yamazaki* (TI); Torii-tohge, 1000 m, *H. Matsuda* (TI); Otoriyama, Higashiyamanashi-gun, *Y. Fujita* (TI); Mt. Kushigata, 800 m, *H. Matsuda* (TI); Yamanaka-ko, I. Hurusawa (TI); Mt. Kentokusan, Santomi-mura, Higashiyamanashi-gun, *K. Midorikawa 1742* (TI). — Nagano: Mt. Moriya-san, Suwa-shi, 1100–1650 m, *K. Midorikawa* (TI); Mt. Amakazari, *T. Yahara et al. 7168* (TI); Yoriaido–Sakai-toge, Nagawa-mura, *T. Yahara et al. 6841, 7205* (TI); Oyouni-shitsugen, near Aoki-ko, 700 m, *T. Yamazaki 3717* (TI); Mt. Ena, Chisato-mura, *H. Kanai* (TI); Uriki, Shimoina-gun, 900 m, *T. Yamazaki 3809* (TI); Mts. Yatsugatake, *H. Kanai 673* (TI); Mt. Asama, *Faurie 548* (KYO); *H. Ito* (TI); Mt. Ontake, *G. Koidzumi* (TI); Kirigamine, *T. Yamazaki* (TI); Mt. Nyugasa-yama, 1000 m, *T. Yamazaki* (TI); Mt. Fuji, 1000 m, *B. Hayata* (TI); Karuizawa, *H. Kanai 2028* (TI); Sugadaira, *K. Sato* (TI); Togakushi-hara, *Hattori* (TI); Nonoumi-shitsugen, Minochi-mura, Shimominoichi-gun, 1100 m, *M. Mizushima 11335* (TI). — Gifu: Mannami to Utsubo, Miyagawa-mura, Yoshiki-gun, 800 m, *K. Iwatsuki & N. Fukuoka 364* (KYO); Kotori pass to Umehara, N of Mt. Ibuse-yama, Yoshiki-gun, *N. Fukuoka 7425* (KYO); Mt. Norikura, *Z. Tashiro* (KYO); Miboro, Shirakawa-mura, Ono-gun, *A. Nitta 12146* (KYO); Nishiure pass, Kiyomi-mura, Ono-gun, 1100 m, *H. Takahashi 1848* (KYO); Hirugano, Takasu-mura, Gujo-gun, 900 m, *G. Murata 14377* (KYO); Mt. Dainichi-dake, Shiratori-cho, Gujo-gun, *H. Nishimura & K. Ueda* (KYO); Hosokute, Hiyoshi-cho, Nizunami-shi, 400 m, *G. Murata et al. 323* (KYO); Monzen to Mt. Myohogatake, Tanigumi-mura, Motosu-gun, *H. Takahashi 4568* (KYO); Sugihara to Mt. Hinaga-dake, Itadori-mura, Mugi-gun, 400 m, *Y. Inamasu 391* (KYO); Dodogamine, Mitahora, Gifu-shi, 100–200 m, *H. Takahashi 6282* (KYO); Kanmuri-toge to Mt. Kanmuri-yama, Fujihashi-mura, Ibi-gun, 1000 m, *H. Takahashi et al. 1046* (KYO); NE slope of Mt. Ibuki, 400 m, *N. Fukuoka 5865* (KYO). — Shizuoka: Ippeki-ko, Izu, *K. Kumura 301796* (KYO); Tokuyama, Suruga, 300 m, *T. Yamazaki* (TI); Ryuko-san, N of Shizuoka, *Y. Kurosawa* (KYO); Shizuoka, *Faurie 3501* (KYO); Koizumi-mura, *H. Muramatsu* (TI); Mts. Ashitaka, 900 m, *H. Kanai 7328* (TI); Mizukubo, Sunto-gun, *H. Kanai 7044* (TI). — Aichi: Kiyosaki, Shitara-cho, *K. Torii* (KYO); Tsukude-mura, Kitashitara-gun, 450 m, *G. Murata 7361, 13230* (KYO), *K. Torii* (KYO); Jokoji to Miagari-ike, Seto-shi, 200 m, *M. Ito 691, 693* (KYO); Tashiro, Nagoya-shi, *T. Makino* (TI); Kamiwatarai, Fujioka-cho, Nishikamo-gun, 150 m, *K. Ueda & M. Ito 104* (KYO). — Mie: Kitayama-gawa, Kamikawa-mura, Minamimuro-gun, *H. Kanai* (TI); *T. Koike 48* (KYO); Mifune-mura, Minamimuro-gun, *T. Nakajima* (TI). — Shiga: Takayama to Mt. Kanakuso, Asai-cho, 700 m, *G. Murata 20770* (KYO); Mt. Ibuki, 1200–1370 m, *N. Fukuoka 6335* (KYO); Mt. Ryozen, 1000 m, *N. Fukuoka 6244, 6247* (KYO); Oike-dake, Inukami-gun, *H. Koyama & N. Fukuoka 18* (KYO); An'yoji, Kirihara-mura, Gamo-gun, *C. Hashimoto 4308* (KYO); Mikuni-san, *Z. Tashiro* (KYO); Mt. Hira, 400–1200 m, *S. Kitamura* (KYO), *T. Yahara et al. 99* (KYO), *G. Murata 19011* (KYO); Mt. Hiei, 700 m, *H. Ohashi 8871* (TI). — Kyoto: Ikari-kogen, Takeno-gun, 700 m, *M. Hiroe 8016* (KYO); Mt. Oeyama, 800 m, *G. Murata 20098* (KYO); Ashiu Ex-

perimental Forest, 400–650 m, *M. Tagawa* (KYO), *G. Nakai 3322* (KYO), *H. Nagamasu 2062, 2067, 2068* (KYO); Daihizan, Sakyo-ku, 500–900 m, *H. Nagamasu 76* (KYO); Kibune, *M. Tagawa 925* (KYO); Hirogawara to Hatcho, Keihoku-cho, *G. Murata 20849* (KYO, TI); Ohara, Kyoto, *G. Nakai 2252* (KYO). — Hyogo: Mt. Torokawa-yama, Muraoka-cho, Mikata-gun, 700 m, *G. Murata 20908* (KYO, TI); Kirigataki, NE foot of Mt. Oginosen, Onsen-cho, Mikata-gun, 400–740 m, *N. Fukuoka 11095* (KYO); Umigami to Mt. Oginosen, *G. Murata 20708* (KYO); S slope of Mt. Hachibuse-yama, Sekinomiya-cho, Yabu-gun, 800–1200 m, *N. Fukuoka 10507* (KYO); Myokensan, Yabu-gun, *S. Hosomi* (KYO); Hyonosen, *S. Hosomi 6017* (KYO). — Nara: Ninnikusen, Nara-shi, 300 m, *M. Ito & E. Kinoshita 60* (KYO); Sakamoto, Totsukawa-mura, Yoshino-gun, *H. Nishimura & I. Kozima 4* (KYO). — Wakayama: Koyasan, *N. Kinashi* (KYO), *Z. Tashiro* (KYO), *N. Satomi 13130* (TI); Doro-kyo, *Ui 61* (TI). — Tottori: Okinoyama-kokuyurin, *Z. Tashiro* (KYO); Wakasa-cho, Yazu-gun, *A. Tanaka 22763* (KYO); Mt. Daisen, *G. Koidzumi* (KYO), 1400 m, *N. Kitagawa 5225* (KYO); Tari-mura, Hino-gun, *N. Satomi 43* (TI). — Shimane: Oki Is., Daimanji-yama, Saigo-cho, *K. Nagai* (KYO), *N. Satomi 9428* (TI). — Okayama: Kuroiwa-kogen, Aba-mura, Tomata-gun, *A. Tanaka 17569* (KYO); Onbara-kogen, Kamisaibara-son, Tomata-gun, 740–850 m, *T. Fujii 1269* (KYO); Mt. Kamihiruzen, Nakahukuda to the summit, 1000 m, *G. Murata 27204* (KYO); Nakayama, Wake-gun, *G. Masamune* (TI); Ikeda-mura, Kibi-gun, *J. Nishida 1162* (TI). — Hiroshima: Mt. Eboshi to Mt. Hiba, Saijo-cho, Hiba-gun, 800–1300 m, *K. Ueda & M. Takamiya 723, 730* (KYO, TI); Goryo-san, Mts. Hiba, *S. Takafuji 611* (KYO); Miyoshi-shi, *S. Okamoto* (KYO); Joge-cho, Konu-gun, *Z. Tashiro* (KYO). — Yamaguchi: Sasanami, Abu-gun, *K. Oka 19085* (KYO). **Shikoku**. Tokushima: Mt. Takagi-yama, Kisawa-mura, Naka-gun, 1350–1500 m, *S. Fujii 1046* (KYO), *G. Murata et al. 56065* (KYO). — Kagawa: Kitaura-mura, Shozu-gun, *R. Hirama 805* (TI). — Ehime: Mt. Higashiakaishi–Mt. Hutatsudake, Uma-gun, 1600 m, *G. Murata 14990* (KYO). — Kochi: E foot of Mt. Torigata, Takaoka-gun, *T. Shimizu 5916* (KYO); Tengu ridge to Ohikiwari pass, Shikoku-karst, Yasuhara-cho, Takaoka-gun, *N. Fujita & E. Miki 64* (KYO); Mt. Yokogura, *T. Tuyama* (TI). **Kyushu**. Fukuoka: Asakura-gun, *Z. Tashiro* (KYO); Amagi-cho, Asakura-gun, *C. Kuwano* (KYO). — Nagasaki: Unzen, *S. Okamoto* (KYO), 1100 m, *S. Toyama* (TI), 1360 m, *K. Midorikawa* (TI). — Kumamoto: Hiramaki-mura, Kikuchi-gun, *S. Tokunaga* (KYO); Oguni, Aso-gun, *H. Kaneda TNS91366* (TNS); Nojiri-mura, Aso-gun, *H. Kamizuma* (KYO); Namino-mura, Aso-gun, 600 m, *S. Hatusima et al. 22272* (KYO); Kunimidake, *K. Nakajima* (KYO); Mt. Shiraga, Itsuki-mura, *K. Maebara 590* (KYO); Kawa-mura, Kuma-gun, *T. Doi 265* (KYO). — Oita: Kurodake, *S. Okamoto* (KYO). — Miyazaki: Hososhima, *Z. Tashiro* (KYO), *S. Kitamura* (KYO); Onikubo, Kawaminami-cho, 30 m, *S. Hatusima et al.* 22752 (KYO); Mt. Osuzu, *I. Hurusawa* (TI). — Kagoshima: Mt. Kirishima, Karakunidake, *S. Kitamura* (KYO); Komura, *Z. Tashiro* (KYO); Aira-gun, *Z. Tashiro* (KYO).

KOREA. Hamkyongpuk-do: Myongchon, *T. Nakai 7676* (TI). — Hamkyongnam-do: Hamhung, *N. Nomura* (KYO); Shinhung, *G. Koidzumi* (KYO). — Pyonganpuk-do: Unsan, *T. Nakai 2214* (TI); Myohyangsan, *G. Koidzumi* (KYO). — Pyongannam-do: Yangduk, *T. Nakai 12432* (TI). — Whanghaenam-do: Changsu-san, *R.K. Smith 38* (TI); Changsan Cut, *T. Nakai 13344* (TI); Taechong do, *T. Nakai 13345* (TI). — Kangwon-do: *Faurie 522, 769* (KYO); Changjun, *T. Nakai 6074* (TI); Kumgang-san, *J. Ohwi 45* (KYO), *G. Koidzumi* (KYO); Wekumgang-san, *G. Koidzumi* (KYO), *S. Kitamura* (KYO); Sulak-san, *T. Nakai 17550* (TI). — Kyonggi-do: Seoul, *S. Kitamura* (KYO), *Sakaguchi 57* (KYO); Pukansan, Seoul, *Faurie 523* (KYO); Kapyong, *H.-D. Chang 1178* (KYO); Kwangnung, *G. Koidzumi* (KYO). — Kyongsangpuk-do: Mt. Kayasan, *G. Koidzumi* (KYO). — Kyongsangnam-do: Mt. Chirisan, *S. Okamoto* (KYO), *J. Ohwi 6772, 6773* (KYO), *T. Nakai 114* (TI); Haeinsa to Mt. Kayasan, Hyeonchon-gun, 700–800 m, *K. Ueda et al. 1115, 1120* (KYO); Pomosa, Pusan, *Faurie 988* (KYO), *G. Koidzumi* (KYO); Pusan, *Faurie 723 p.p.* (KYO); Koje do, *T. Nakai 11993* (TI). — Chungchongnam-do: *T. Nakai 8137, 8138* (TI), *M. Kitagawa* (TI). — Chollapuk-do: Togyu-san, Changsu-gun, *H. Chang 981* (KYO). — Chollanam-do: Paegyang-san, *G. Koidzumi* (KYO). — Jeju-do: Jeju, *K. Nakajima 79* (KYO); Yengsil, *Taquet 4341* (TI); Hallaisan, *T. Nakai 322* (TI).

CHINA. Liaoning: Hoten (Shenyang), *M. Nishimura* (TI). — Shandong: Qingdao, *S. Miki* (KYO).

Notes. 1. In western Japan, *S. sawafutagi* is often sympatrically distributed with *S. coreana*, but the former usually blooms 1 to 2 weeks earlier than the latter.

2. Neither the epithet 'pilosa' nor 'leucocarpa' is available at species rank because

of the existence of earlier homonyms, *S. pilosa* Rehder (1916) and *S. leucocarpa* Brand (1916). The proposed new epithet 'sawafutagi' is a Japanese vernacular name of this species.

3. *Symplocos sawafutagi* has been treated as a variety of *S. chinensis* (Lour.) Druce distributed in S China and Taiwan. The latter is distinguished by yellowish hairs, a larger corolla of 4–5 mm long, more stamens ranging 50–60 and black fruits. Here, *S. sawafutagi* is treated as a distinct species, because I am not sure whether these species are the closest allies or not in this complicated section *Palura*.

4. **Symplocos paniculata** (Thunb. *ex* Murray) Miq. — Fig. 3-4, Map 4, Plate 54b–d, 55a.

S. paniculata (Thunb. *ex* Murray) Miq., Ann. Mus. Bot. Lugd-Bat. 3: 102 (1867); Prol. Fl. Jap.: 266 (1867), *p.p.*; Sargent, Pl. Wils. 2: 593 (1916); Li, Taiwania 1: 315 (1950); Ohwi, Fl. Jap.: 931 (1953); Bailey, Man. Cult. Pl. ed. 2: 792, t. 164 (1954); Hatusima, J. Geobot. 12: 72 (1963); Ohwi, Fl. Jap. English ed.: 725 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 96, t. 112 (1971); Nooteboom, Leid. Bot. Ser. 1: 258 (1975), *p. min. p.*; Wu, Fl. Reip. Pop. Sin. 62(2): 72 (1987), *p.p.*; Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 188-1 & 2 (1989). — *Prunus paniculata* Thunb. *ex* Murray, Syst. Veg. ed. 14: 463 (1784); Thunberg, Fl. Jap.: 200 (1784); Persoon, Syn. Pl. 2: 34 (1807); Steudel, Nomencl. Bot. ed. 1.: 663 (1821). — *S. crataegoides* Buch.-Ham. *ex* D. Don forma *major* Franch. & Sav., Enum. Pl. Jap. 2: 433 (1878). — *Eugeniodes paniculatatus* O. Kuntze, Rev. Gen. Pl. 2: 410 (1891). — *Palura paniculata* Nakai, Tr. & Shr. ed. 1: 229 (1922); Hara, Enum. Sperm. Jap. 1: 109 (1948). — Type: *Thunberg* (UPS, microfiche! and photograph!), Japan.

S. paniculata var. *glabrifolia* Miq., Prol. Fl. Jap.: 266 (1867). — *S. crataegoides* var. *glabrifolia* Koidzumi, Fl. Symb. Or. Asia: 19 (1930). — Type: *Keiske* (L!, Plate 54b), Mt. Hiruyama, Figo, Japan.

S. paniculata var. *parvifolia* Miq., Prol. Fl. Jap.: 266 (1867). — Type: *Keiske* (L!, Plate 54c), Japan.

S. pallida Franch. & Sav., Enum. Pl. Jap. 1: 308 (1875), *nomen nud.* — *S. crataegoides* var. *pallida* Franch. & Sav., *op. cit.* 2: 433 (1878); Matsumura, Ind. Pl. Jap. 2(2): 486 (1912). — *Palura paniculata* var. *pallida* Nakai, Tr. & Shr. ed. 2: 307 (1927); Hara, Enum. Sperm. Jap. 1: 109 (1948). — Type: *Savatier 2908* (P, *non vidi*, isotype in P!, Plate 54d), Japan.

S. paniculata var. *glabra* Makino, Bot. Mag. Tokyo 18: 112 (1904). — *S. crataegoides* var. *glabra* Matsumura, Ind. Pl. Jap. 2(2): 486 (1912). — *Palura paniculata* var. *glabra* Honda, Bot. Mag. Tokyo 47: 298 (1933). — Lectotype: *K. Mori* (MAK!, Plate 55a), Kamikano-mura, Mino, Japan. (designated here).

S. crataegoides auct. *non* Buch.-Ham. *ex* D. Don: Brand, Pfl. R. Heft 6: 33 (1901), *p.p.*

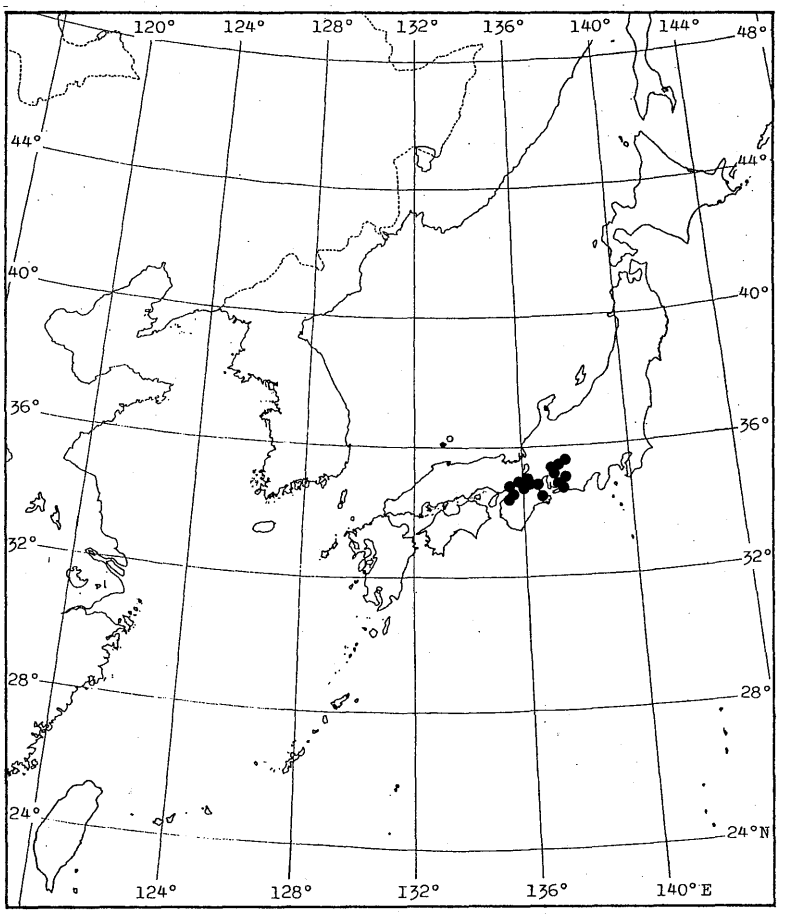
Deciduous shrubs or small trees; bark gray-brown, longitudinally fissured. Twigs glabrous, often tinged red. Buds dark brown, with glabrous scales with ciliate margin. *Leaves*: blades papery, obovate to oblong, 4–10 cm long, 2.5–4 cm wide, apex acute to acuminate, base cuneate, margin glandular serrulate; upper surface glabrous or pilose on midrib; lower surface glabrous or patently hairy on midrib and nerves; midrib impressed on upper surface, prominent on lower surface; nerves 4–5 pairs, prominent on lower surface; reticulation fine, distinctly visible; petioles 3–10 mm long. *Inflorescence* a panicle, 4–10 cm long, the axis glabrous; bracts and bracteoles linear to ovate, ciliate, 0.5–1 mm long, soon caducous; pedicels slender, 0–5 mm long. *Flowers*: calyx tube glabrous, 1–1.5 mm long; calyx lobes imbricate, glabrous, elliptic to narrowly ovate with ciliate margin, 1–1.5 mm long; corolla white, deeply 5-lobed, with shortly ciliate margin, about 4 mm long; stamens 25–45, pentadelphous; disk 5-glandular, glabrous; style glabrous, 3–4 mm long; ovary 2-locular, with 4 ovules in each locule. *Fruits* black, globose to obliquely ovoid, 6–8 mm long, 4–6 mm in

diameter, crowned by the persistent calyx lobes; mesocarp thin; seeds 1, reniform with copious endosperm and curved embryo. *Pollen grains* (2–)3(–4)-colporate, angular to semi-angular in polar view, oblate in equatorial view; tectum irregularly suprareticulate; ora transversely slit-like; 18.9–21.3 μm (P) × 29.0–34.4 μm (E); pollen type IIa. —Flowers: May–June. Fruits: Oct.

Jap. name: Kuromi-no-nishigori

Habitat. On marshy ground on swamps or ponds.

Distr. Japan (Honshu), endemic.



Map 4. Distribution of *Symplocos paniculata* (Thunb. *ex* Murray) Miq.

JAPAN. **Honshu**. Nagano: Oto, Misaka-mura*, Nishichikuma-gun, *H. Okuhara* (KANA), *H. Okumura* (MAK). —Shizuoka: Umeda, Kosai-shi, 50 m, *I. Yamashita 150* (Herb. of Shizuoka Univ.). —Aichi: Tsukude-mura, Minamishitara-gun, *N. Fujita & H. Tabata* (KYO), *K. Torii 8898* (KYO), *S. Mimoro et al. 2252* (KYO), *G. Murata 13222* (KYO), *N. Naruhashi & H. Tabata 1123* (KYO, TI, TNS); Ichinomiya-cho, Hoi-gun, *K. Torii* (TI); Ashige-shitsugen, *S. & K. Okuyama 22343* (TNS); Iwato-cho, Toyohashi-shi, *K. Torii 8904* (KYO); Tenpakubara, *K. Torii 8904, 8919* (KYO), *8935* (TI); Jyosui, Toyota-shi, *S. Fujii 2466* (KYO); Joukouji, Kutsukake to Miyagami-ike, Seto-shi, *K. Ueda & M. Ito 94*

(KYO); Higashiyama, Nagoya, *F. Maekawa 166B916* (TI). — Gifu: Kasaji, Ena-gun, *N. Kinashi* (KYO); Hiyoshi-cho, Mizunami-shi, 400–500 m, *S. Mimoro 2595* (KYO); Sue, Kagamihara-shi, 50 m, *K. Ueda & M. Ito 675* (KYO); Kasahara-cho, Doki-gun, *K. Shioda 463* (KYO); Tajimi, *K. Shioda 7* (KYO), *11, 12* (TI). — Mie: Mt. Nyudogatake, Suzuka-shi, 500 m, *T. Takagi 22* (KYO); Shinchaya-no-ike, Akeno, Obata-cho, Watarai-gun, *C. Chuma* (TI). — Shiga: Shinohara, *C. Hashimoto*; Ushioyama–Ishiyama, 300 m, *S. Kitamura & G. Murata 2009* (KYO, TI); Seta, *C. Hashimoto 314* (KYO); Gio-cho, Yasu-gun, *C. Hashimoto 270* (KYO); Ishiyama, Shiga-gun, *S. Tanaka* (KYO); Mikami-yama, *C. Hashimoto* (KYO), *G. Murata 13049* (KYO); Gamo-gun, *C. Hashimto* (KYO); Fuse, Yokaichi-shi, 100–200 m, *C. Hashimoto 993, 1011, 1663, 2347* (KYO), *H. Nagamasu 1933, 1934, 1935, 2524* (KYO). — Kyoto: Mizorogaike, Kyoto-shi, *G. Koidzumi, Y. Araki 13779–13782, M. Hiroe 647, S. Kitamura, H. Nagamasu 1815* (KYO); Rengedani, NW of Kyoto, *G. Nakai 306* (KYO); Hanazano, Kyoto-shi, *S. Miki*. — Osaka: Okamachi, Osaka-shi, *Ui 60* (TI); Momoyamadai, Sakai-shi, *K. Hirano* (KYO), *K. Murata* (KYO). — Hyogo: Nakayama, Kawabe-gun, *M. Togashi* (TI). — Nara: Mizukami-ike, Nara-shi, *G. Murata 20884* (KYO, TNS).

*Misaka-mura was incorporated into Nakatsugawa-shi, Gifu Pref.

Notes. 1. This species has also been reported from Hokuriku district. In several herbaria, I saw the specimens identified as *S. paniculata* from Hokuriku district, but they were all misidentified specimens of a glabrous form of *S. coreana* (Lév.) Ohwi.

2. The type specimen of *S. paniculata* var. *glabrifolia* Miq., *Keiske* (L) is labeled as Mt. Hiruyama, Figo. But, in Figo (Kumamoto Pref., Kyushu), this species is not distributed. It might be mislabelled by Keiske.

5. **Symplocos tanakana** Nakai — Fig. 3-5, Map 5, Plate 55b–c.

S. tanakana Nakai, Bot. Mat. Tokyo 32: 227 (1918); Ohwi, Fl. Jap. rev. ed.: 1072 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 96 (1971); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 186-4 (1989). — *Palura tanakana* Nakai, Fl. Sylv. Koreana 12: 34, t. 19 (1923); Tr. & Shr. ed. 2: 312, t. 146 (1927); Hara, Enum. Sperm. Jap. 1: 109 (1948). — Lectotype: *Nakai 6411* (TI!, Plate 55b), sectus torrentes Yibi, Quelpaert, Korea. (designated here).

Palura paniculata var. *pubescens* Nakai, Tr. & Shr. ed. 2: 310 (1927). — *P. chinensis* var. *pubescens* Nakai, Bot. Mag. Tokyo 48: 774 (1934). — *P. pilosa* var. *pubescens* Nakai *ex* Honda, Nom. Pl. Jap.: 274 (1939), *nomen*. — *S. paniculata* var. *pubescens* Ohwi, Bull. Nat. Sc. Mus. Tokyo 33: 83 (1953); Fl. Jap. English ed.: 726 (1965). — Lectotype: *Nakai 1359* (TI!, Plate 55c), Quelpaert, Korea. (designated here).

S. crataegoides auct. *non* Buch.-Ham. *ex* D. Don: Hatusima, J. Geobot. 12: 72 (1963).

S. paniculata auct. *non* (Thunb. *ex* Murray) Miq.: Nooteboom, Leid. Bot. Ser. 1: 258 (1975), *p. min. p.*; Wu, Fl. Reip. Pop. Sin. 60(2): 72 (1987), *p.p.*

S. chinensis auct. *non* (Lour.) Druce: Hand.-Mazz., Beih. Bot. Centralb. 62-B: 39 (1943).

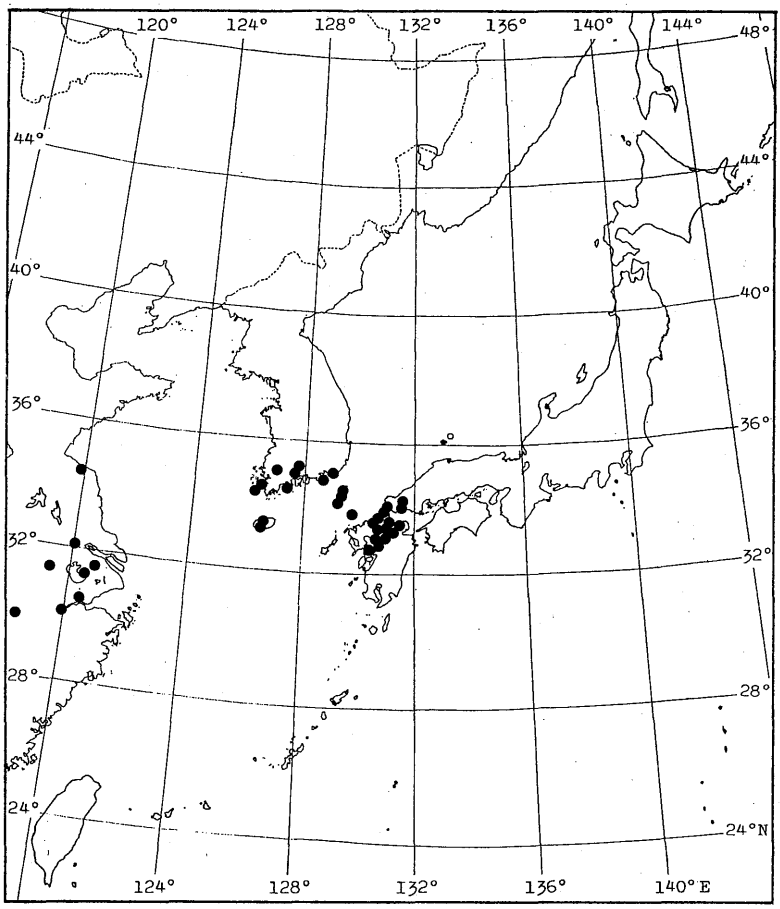
Deciduous trees; bark transversely fissured. Twigs gray-brown to grayish dark violet, densely hairy, sometimes glabrescent. Buds brown, with glabrous or puberulous scales with ciliate margin. *Leaves*: blades ovate to elliptic, 5–10 cm long, 2.5–4(–5) cm wide; apex acute to acuminate; base cuneate to rounded; margin ciliate and glandular serrulate; upper surface glabrous except on the midrib; lower surface glaucous and densely appresedly hairy to glabrescent, with curved hairs on sides and axils of midrib; midrib impressed on upper surface, prominent on lower surface; nerves 6–8 pairs, prominent on lower surface; reticulation fine; petioles 3–10 mm long. *Inflorescence* a panicle, 3–8 cm long, the lower branches usually subtended by foliage leaves; axis densely hairy to glabrescent; bracts and bracteoles linear, ciliate, 0.5–1 mm long, soon caducous; pedicels slender, 0–4 mm long. *Flowers*: calyx tube glabrous, 1–1.5 mm high; calyx lobes imbricate, glabrous, margin ciliate, semi-

circular to ovate, about 1 mm long; corolla white, deeply 5-lobed, 4–5 mm long; stamens 25–40, pentadelphous; disk 5-glandular, glabrous; style 3–4 mm long, glabrous; ovary 2-locular, with 4 ovules in each locule. *Fruits* black, obliquely ovoid, 6–8 mm long, 5–6 mm in diameter, persistent calyx lobes forming a very short beak; mesocarp thin; seed 1, reniform, with endosperm and curved embryo. *Pollen grains* 3-colporate, angular to semi-angular in polar view, oblate in equatorial view; tectum irregularly suprareticulate; ora slit-like; 19.1–19.3 μm (P) × 27.1–27.5 μm (E); pollen type IIa. —Flowers: Apr.–May. Fruits: Oct.–Nov.

Jap. name: Kuromi-no-sawafutagi

Habitat. Warm-temperate mixed forests, often in secondary forests.

Distr. Japan (Honshu: Yamaguchi; Kyushu), S Korea, China.



Map 5. Distribution of *Symplocos tanakana* Nakai.

JAPAN. **Honshu**. Yamaguchi: Niho-mura, Yoshiki-gun, *K. Oka 6920* (TI); Ryuosan, Onoda-cho, *T. Oda 3778* (TI); Hosenji, Konomine, Suwo, *T. Oda 2145* (KYO); Niho, Yamaguchi-shi, *K. Oda 6920* (KYO); Higashiatsuho, Kiuzan, *T. Oda 3674* (KYO); Hatabu, Shimonoseki, *S. Murata* (KYO);

Shintchi, Shimonoseki, *M. Yamazaki* (KYO). **Kyushu**. Fukuoka: Katsuki, Onga, *M. Takenouchi 12317* (KYO); Kusaba-onsen, Kashii, *M. Takaenouchi 1659* (KYO); Koshosan, *G. Koidzumi* (KYO); Takagi-son, Asakura-gun, *Y. Nabeshima*; Munakata-gun, *T. Nakano* (KYO); Kawara-take, *G. Tashiro* (KYO), *Takenouchi & Hanai 12265* (KYO). — Nagasaki: Mayu-yama, Shimabara, *S. Toyama* (KYO); Shimabara, *S. Toyama 6* (TI); Mt. Unzen, *M. Togashi* (TI). Iki Is.: *T. Shinagawa 1950* (TI). Tsushima Is.: *Faurie 4838* (KYO); Mitake, *Z. Tashiro* (KYO); Funakoshi, *Y. Hara* (KYO); Kamiagata-gun, *Hara* (KYO); Tsutsu, Shimoagata-gun, *H. Ohashi & H. Ohba 267* (KYO, TI); Mine, *Y. Yabe* (TI). — Kumamoto: Tsuetate, Aso, *Z. Tashiro* (KYO); Kimbosan, *H. Kamizuma* (KYO); Shodaisan, *Z. Tashiro* (KYO); Yamaga-shi, *Y. Shimada 11371B* (KYO); Mitama-mura, Kamoto-gun, *Z. Tashiro* (KYO); Kiyomizu-cho, Kumamoto-shi, *Tak. Shimizu 86-1195* (KYO). — Oita: Usa, *Z. Tashiro* (KYO); Yokoyama-mura, Usa-gun, *Z. Tashiro* (KYO); Osada, Shimoge-gun, *Z. Tashiro* (KYO); Shimogo, Shimoge-gun, *T. Yamazaki* (KYO); Onodai-yama, Shimoge-gun, *T. Yamazaki* (KYO); Hachimensan, Sanko-mura, *Z. Tashiro* (KYO); Hiji, *Z. Tashiro* (KYO); Daitaro-toge, Hita-gun, *Z. Tashiro* (KYO); Nishitoko, Bungotakada-shi, *Z. Tashiro* (KYO); Mori, *Z. Tashiro* (KYO).

KOREA. Kyongsangnam-do: Pusan, *Faurie 723 p.p.* (KYO), *T. Nakai 11996* (TI), *Z. Tashiro* (KYO); Jinhae, *T. Nakai 11992* (TI); Koje Do, *T. Nakai 11994* (TI); Mt. Chiri, *T. Nakai 509* (TI); Nogodan, Chiisan, *M.-K. Pak 188* (KYO). — Chollanam-do: *J. Ohwi* (KYO); Mudung-san, Kwangju, *H.-D. Chang 1764* (KYO); Moppo, *T. Uchiyama* (TI); Owelalo Do, *T. Nakai 11989* (TI); Tolsan Do, Yeosu, *T. Nakai 11990* (TI); Chongsan Do, *T. Nakai 11997* (TI). — Jeju-do: *Nakai 1359, 6410, 6411* (TI), *Taquet 5801* (TI); Hallai-san, *Faurie 1891 p.p.* (KYO).

CHINA. Jiangsu: Lianyun, *T. Kanashiro 5539* (KYO); Nanjing, 75 m, *K.-S. Chow 80332* (KYO). — Zhejiang: Ningpo, *C.W. Everard* (KYO). — Anhui: Wangshan, *Chow 143* (KYO); Ma'anshan, *K. Yao 8521* (KYO). — Hubei: Wuhan, *Long 038* (KYO); Shennongjia, 980 m, *G.-F. Tao & Z.-D. Jiang 248* (KYO).

Sect. 2. **Lodhra** G. Don

Key to the species

1a. Racemes 10 to 30-flowered; stones narrowly ovoid to ellipsoid; seeds straight; young twigs gray. ..... 9. *S. prunifolia*

1b. Racemes 3 to 12(–17)-flowered; stones ampulliform to ovoid; seeds curved; young twigs green or brown.

2a. Young twigs brown; racemes 5 to 10-flowered. ..... 8. *S. caudata*

2b. Young twigs green; racemes 3–6 or 5–12(–17)-flowered.

3a. Pedicels slender, 8–15 mm long; racemes loosely 3 to 6-flowered; ora of pollen grains prominent. ..... 6. *S. myrtacea*

3b. Pedicels 1–8(–12) mm long; racemes 5 to 12(–17)-flowered; ora of pollen grains not prominent. ..... 7. *S. liukiuensis*

6. **Symplocos myrtacea** Sieb. & Zucc. — Fig. 3-6 & 4k, Map 6, Plate 55d, 56a–b.

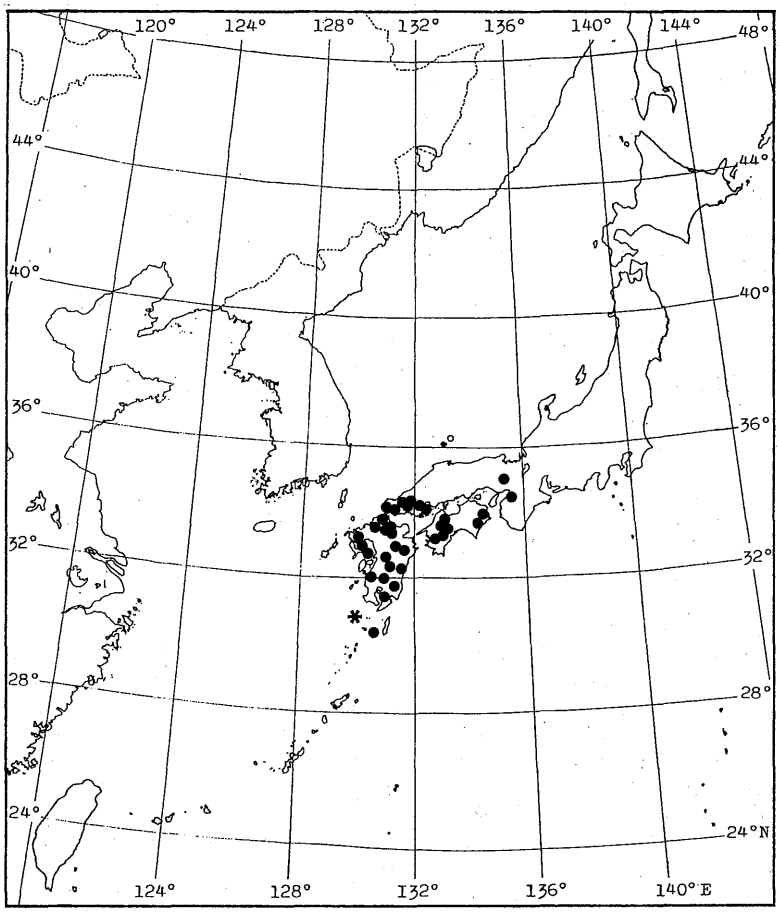
S. myrtacea Sieb. & Zucc., Fam. Nat. 2: 133 (1846); Miq., Prol. Fl. Jap.: 267 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 509 (1874); Brand, Pfl. R. Heft 6: 66 (1901); Matsumura, Ind. Pl. Jap. 2(2): 487 (1912); Ohwi, Fl. Jap.: 931 (1953); *ibid.* English ed.: 726 (1965); Kitamura & Murata, Wood. Fl. Jap. 1: 96, t. 96 (1971); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 171, pl. 188-4 & 5 (1989). — *Bobua myrtacea* Miers, J. Linn. Soc. Bot. 17: 306 (1879); Nakai, Tr. & Shr. ed. 1: 237, t. 132 (1922); *ibid.* ed. 2: 319, t. 149 (1927); Masamune, Fl. & Geo. Yakus.: 365 (1934). — *Dicalix myrtacea* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *von Siebold* (L!, Plate 55d; LE, MAK!), Japan.

S. myrtacea var. *latifolia* Hatusima, J. Jap. Bot. 26: 373 (1951). — Type: *S. Hatusima 13431* (KAG!), Kuroshima Is., Ohsumi, Japan.

S. myrtacea var. *pubescens* Uyeki & Tokui, J. Jap. Bot. 29: 229 (1954). — Type: *O. Tokui* (MATSU!, Plate 56a; isotype in KYO!), Omogo-kei, Iyo, Shikoku, Japan.

S. sumuntia auct. *non* Buch.-Ham. *ex* D. Don: Nooteboom, Leid. Bot. Ser. 1: 284 (1975), *p. min. p.*

Small evergreen trees; bark dark brown tinged with violet, smooth. Twigs brown, terete; young twigs green, glabrous, slender, about 1 mm in diameter. Terminal buds glabrous, subulate, often curved, 3–7 mm long. *Leaves*: blades thinly coriaceous, widely elliptic to elliptic, ovate, narrowly ovate to lanceolate, 3–7 cm long, 1–3 cm wide; apex caudate with apiculate tip; base rounded or sometimes cuneate; margin slightly recurved, undulate serrate with teeth 2–5 mm apart; both surfaces glabrous; midrib slightly impressed on upper surface at least near base, slightly prominent on lower surface; nerves 4–6 pairs, slightly prominent on both surfaces; petioles slender 8–15 mm long. *Inflorescence* an axillary simple raceme, loosely (1–)3 to 6-flowered, (1–)2–4 cm long, axis and pedicels glabrous or rarely sparsely with brown hairs, on nodes often with brown hairs; pedicels slender, 8–15 mm long; bracts ovate to elliptic, boat-shaped, 4–6 mm long, caducous, inside glabrous, outside with dense appressed brown hairs; bracteoles 2, narrowly ovate to lanceolate, boat-shaped, about 3 mm long, caducous, inside glabrous, outside with same indument as bracts.



Map 6. Distribution of *Symplocos myrtacea* Sieb. & Zucc. Var. *myrtacea* (disk) and var. *latifolia* Hatusima (star).

Flowers: calxy tube glabrous, 1.5 mm high, calyx lobes triangular, about 1 mm long, glabrous, the margin often ciliate, rarely with brown hairs at the apex; corolla white, deeply 5-lobed, 6–7 mm long, lobes elliptic; stamens 25–40, connate only at base; disk annular, glabrous; style 5–6 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* dark violet, narrowly ovoid, 7–8 mm long, 3–5 mm in diameter, crowned by the persistent calyx lobes; stone ampulliform to ovoid, smooth to slightly grooved, 4–6 mm by 3–4 mm; mesocarp thin; seed 1, curved, with endosperm and curved embryo. *Pollen grains* 3(–4)-colporate, semiangular in polar view, oblate to suboblate in equatorial view; colpus very short; tectum densely and fine verrucate; ora circular to transversely elliptic; 22.0–23.4 μm (P) × 28.8–32.1 μm (E); pollen type IIb. —Flowers: late Apr.–May. Fruits: Aug.–Sept.

Jap. name: Hainoki

Habitat. Warm-temperate forests, often dominant in understory of *Abies-Tsuga* forests.

Distr. Japan (Honshu, Shikoku, Kyushu), endemic.

Key to the varieties

1a. Blades elliptic, ovate, narrowly ovate to lanceolate, 2.5–5 times longer than broad. ..... 6-1. var. *myrtacea*

1b. Blades widely elliptic to ovate, 1.7–2.5 times longer than broad. ..... 6-2. var. *latifolia*

6-1. var. **myrtacea** — Plate 56a.

All synonyms except *S. myrtacea* var. *latifolia* Hatusima

Blades elliptic, ovate, narrowly ovate to lanceolate, 4–7 cm by 1–2.5 cm.

Distr. Japan (Honshu, Shikoku, Kyushu), endemic.

JAPAN. **Honshu**. Osaka: Nanokawa, Izumi, *S. Matsuda TNS32085* (TNS). —Hyogo: Saikouji-san, Nishiwaki-shi, *H. Muroi TNS100062* (TNS). —Shimane: Suzuno'otani-yama, *S. Okuyama & H. Utsumi 11549, 11550, 11553, 11554, 11555* (TNS). —Hiroshima: Aku-dani, Shiwa-mura, Saeki-gun, *M. Wada 4043* (KYO); Itsukushima Is., *M. Hotta 6087* (KYO), *H. Muramatsu* (TI). —Yamaguchi: Sazanami-mura, Abu-gun, *J. Nishina TNS260795* (TNS); Nameri-yama, Saba-gun, *S. Okamoto* (KYO), *K. Oka 6738* (KYO), *12031* (TNS); Chomon-kyo, *G. Koidzumi* (KYO), *H. Migo* (KYO), *H. Masaki 13676* (KYO); Doigatake, Ayagi-mura, Mine-gun, *T. Nakai* (TI); Sakane-mura, Kuga-gun, *Z. Tashiro* (KYO); Miyano, Suwo, *J. Oda* (KYO); Sekichukei, Toyoura-gun, *H. Migo* (KYO). **Shikoku**. Tokushima: Sanagochi-mura, Myodo-gun, *T. Inobe 8* (TI), *J. Nishina 46906* (TNS). —Ehime: Onigajo-yama, *T. Nakai* (TI); Mt. Ishizuchi, *R. Yatabe* (TI); Omogo, *N. Satomi* (TI); Nametoko, *S. Okuyama 22986* (TNS); Kita-gun, *T. Imaizumi 103* (KYO); Nishiuwa-gun, 820 m, *Y. Nomura 15* (KYO); Sakase-yama, Kamiukena-gun, *G. Koidzumi*. —Kochi: Godai-san, *TNS23506* (TNS); Kuroson, *S. Okuyama 15751* (TNS); Mt. Irazu-yama, Higahsitsunoyama-mura, Takaoka-gun, *M. Tagawa 2868* (KYO); Mt. Yokogura, Ochi-cho, Takaoka-gun, *G. Murata & T. Shimizu 697* (KYO); Mt. Kakusho-mori, Takaoka-gun, *T. Shimizu 5918* (KYO); Narukawa–Otakijinja, Tamioka-mura, 600 m, *G. Murata & T. Shimizu* (KYO). **Kyushu**. Fukuoka: Adachi-yama, Moji, *T. Hashimoto* (TI); Ehiko-san, *Faurie 111* (KYO); Mt. Inugatake, 600 m, *M. Hotta 6159* (KYO), 400–1130 m, *T. Yahara et al. 5508* (KYO). —Saga: Mt. Tara-dake, *J. Chiba* (KYO); Mt. Kurokami-san, 120–518 m, *H.Nagamasu 1889* (KYO). —Nagasaki: Mt. Tara-dake, *Z. Tashiro* (TNS), *T. Yamazaki* (TI); Omura, *S. Toyama* (TNS); Unzen to Shimabara, *M. Togashi TNS81712* (TNS). —Kumamoto: Yadake, *Z. Tashiro* (KYO, TNS); Izumi-mura, Yatsushiro-gun, 600–700 m, *M. Hotta 12011* (KYO); Ichifusa, *Faurie 3899* (KYO). —Oita: Mt. Sobo, *Faurie 3276* (KYO), *Z. Tashiro* (KYO), Obira to the summit, *N. Fujita 660* (KYO); Mt. Katamuki-san, *S. Kitamura* (KYO); Uwahara to Tsuzura, Onogun, 500 m, *N. Fujita & H. Takahashi 45* (KYO); Kin'unkyo, Fukayabakei, Kusu-gun, 400 m, *G. Murata 45669* (KYO). —Miyazaki: Mt. Okue, Sanriga-

wara, 900 m, *K. Inoue 1122* (TI); Mt. Osuzu-yama, 500–700 m, *H. Koyama 7590* (KYO), *N. Fukuoka 7166* (KYO); Mt. Ougiyama to Matuki, Shiiba-mura, Higashiusuki-gun, *M. Hotta 10464* (KYO); Mts. Kirishima, Mt. Hinamori, *Z. Tashiro* (KYO), Mt. Karakuni, *Z. Tashiro* (KYO); Ebino-kogen, *G. Murata et al. 165* (KYO); Mt. Wanizuka, Tano-mura, *M. Nagasawa TNS113285* (TNS). — Kagoshima: Mt. Takakuma, *G. Koidzumi* (KYO, TI), Uchino to Ontake, 500 m, *G. Murata & H. Nakamura 32* (KYO), *T. Yamazaki et al.* (KYO, TI); Mts. Kirishima, Maruo, *Z. Tashiro* (KYO); Mt. Shibisan, Shibitoge, 400 m, *M. Togashi MT7002* (KYO); Mt. Kaimon, *Y. Hashiguchi* (KYO). Yakushima Is.: *Faurie 3811* (KYO); Mt. Kuniwari-dake, *S. Okamoto* (KYO); Mt. Shichigo-dake, 1000–1100 m, *H. Doei & H. Nagamasu 4* (KYO); Kosugidani, 750 m, *H. Ohba 662599* (TI); Kosugidani–Takatsuka-goya, 800 m, *G. Murata & H. Tabata 514* (KYO); Shiratani-unsuikyo, 620–900 m, *J. Murata et al. 15817* (TI); Hanayama, *S. Mitsuta & H. Doei 704* (KYO, TI); and many other collections.

6-2. var. **latifolia** Hatusima — Plate 56b.

S. myrtacea var. *latifolia* Hatusima

Blades widely elliptic to ovate, 3–6 cm by 1.5–3 cm.

Jap. name: Hiroha-hainoki

Distr. Japan (Kyushu: Kuroshima Is.), endemic.

JAPAN. **Kyushu**. Kagoshima. Kuroshima Is.: *S. Hatushima 13431* (KAG), *M. Sato 2017* (TNS); Mt. Yokodake, 600 m, *S. Sako 599* (KAG; KYO, Plate 56b).

7. **Symplocos liukiuensis** Matsumura — Fig. 3-7, Map 7, Plate 56c–d, 57a.

S. liukiuensis Matsumura, Bot. Mag. Tokyo 15: 78 (1901); Walker, Imp. Tr. Ryukyu Is.: 268 (1954); Hatusima, Fl. Ryukyus: 478 (1971) 478. — *Bobua liukiuensis* Sasaki, Cat. Gov. Herb.: 408 (1930); Nemoto, Fl. Jap. Suppl.: 582 (1936). — *Dicalix liukiuensis* Hara, Enum. Sperm. Jap. 1: 105 (1948). — Type: *Y. Tashiro* (TI!, Plate 56c), Okinawa, Ryukyu Isls., Japan.

S. obana Masamune, Trans. Nat. Hist. Soc. Form. 30: 60 (1940). — *Dicalix obanus* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *Ohba 12* (TAI, *non vidi*, isotype in KYO!, Plate 56d), Tina, Okinoerabu Is., Ryukyu Isls., Japan.

S. sumuntia auct. *non* Buch.-Ham. *ex* D. Don: Nooteboom, Leid. Bot. Ser. 1: 284 (1975), *p. min. p.*; Shimabuku, Check List Ryukyu Is.: 354 (1990).

S. caudata auct. *non* Wall. *ex* G. Don: Hatusima, Fl. Ryukyus rev. ed.: 888 (1975); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, pl. 193-4 (1989).

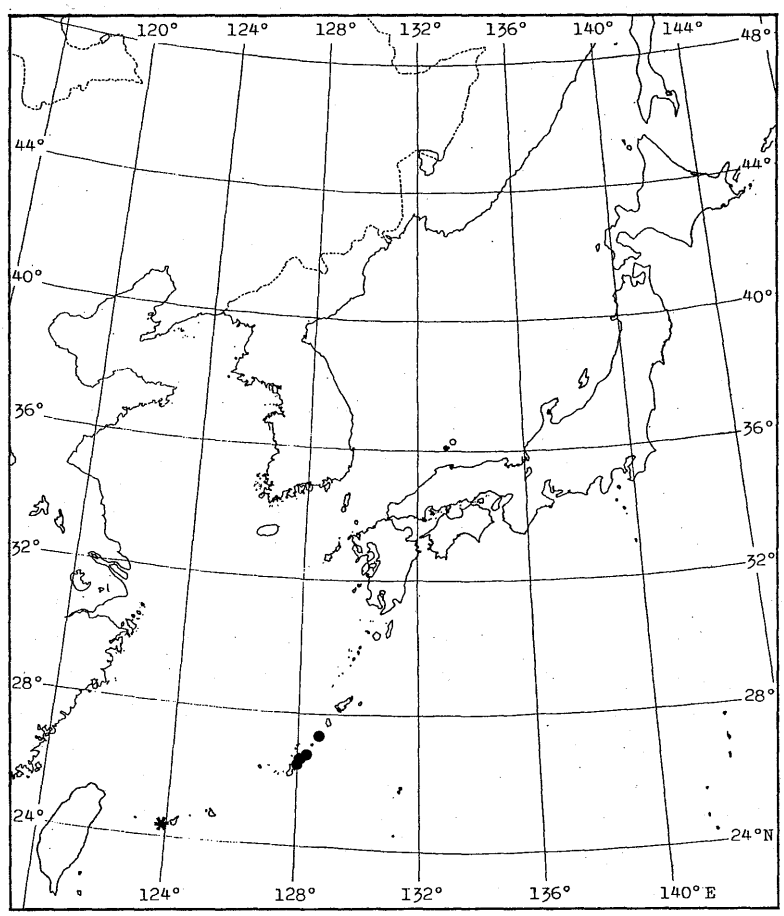
S. prunifolia auct. *non* Sieb. & Zucc.: Walker, Fl. Okinawa South Ryukyu Is.: 832 (1976).

Evergreen trees; bark dark brown, smooth. Twigs dark brown, terete; young twigs green, glabrous. Terminal buds ovoid, narrowly ovoid or subulate, 2–6 mm long, apex acute and often curved, with a few glabrous or puberulous, ciliate-margined scales. *Leaves*: blades coriaceous, elliptic to narrowly elliptic, 4–12 cm long, 1.5–4 cm wide; apex caudate with apiculate tip; base cuneate-attenuate; margin recurved, crenate with teeth 2–8 mm apart; both surfaces glabrous; midrib impressed on upper surface, prominent on lower surface; nerves 4–7(–8) pairs, slightly prominent on both surfaces; petioles glabrous, 5–15 mm long. *Inflorescence* an axillary simple raceme, loosely 5 to 12(–17)-flowered, 2–8 cm long, axis and pedicels glabrous or sparsely pilose; pedicels 1–8(–12) mm long; bracts gradually changing from orbicular at base to obovate at top, or ovate at base to obovate at top, boat shaped, 3–5 mm long, caducous, adaxially glabrous, abaxially densely appressed hairy, but lower bracts often glabrescent except for ciliate margin; bracteoles 2, elliptic or narrowly

elliptic, 2.5–3 mm long, the apex acute, margin ciliate, often glandular denticulate near base, inside glabrous, outside with same indument as bracts. *Flowers*: calyx tube glabrous, 1.5 mm high; calyx limb 1.5–3 mm long; calyx lobes ovate to triangular 1.5–3 mm long, outside often pilose near apex, margin ciliate; corolla pale violet, deeply 5-lobed, 6–7 mm long, the lobes elliptic; stamens 15–35(–45), connate at base; disk annular, glabrous; style glabrous, 5–9 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* ampulliform, 7–8 mm by 4–5 mm, crowned by persistent calyx lobes; stone ampulliform, smooth to slightly grooved, 5–6 mm by 3–4 mm; mesocarp thin; seed 1, curved, with curved embryo. *Pollen grains* 3-colporate, angular to semiangular in polar view, oblate in equatorial view; tectum fine corrugate and partly verrucate; colpi very short; ora transversely elliptic; 23.3–24.2 μm (P) × 32.5–33.7 μm (E); pollen type IIc. —Flowers: Jan.–Apr. Fruits: Dec.–Feb. (Takushi, 1983).

Jap. name: Aobana-hainoki

Habitat. Subtropical montane evergreen forest.



Map 7. Distribution of *Symplocos liukiuensis* Matsumura. Var. *liukiuensis* (disk) and var. *iriomotensis* Nagamasu (star).

Distribution. Japan (Ryukyu), endemic.

Key to the varieties

1a. Leaves coriaceous, nerves 4–6 pairs, blades 4–8 cm long, 1.5–3 cm wide. 7-1. var. *liukiuensis*
1b. Leaves thinly coriaceous, nerves 6–7(–8) pairs, blades 7–12 cm long, 2.5–4 cm wide. ..... 7-2. var. *iriomotensis*

7-1. var. **liukiuensis** — Plate 56c–d.

All synonyms

Terminal buds ovoid to narrowly ovoid, 2–4 mm long, with a few glabrous or puberulous ciliate-margined scales, apex acute, often curved. *Leaves*: blades coriaceous, elliptic, 4–8 cm long, 1.5–3 cm wide; margin with teeth 4–8 mm apart; nerves 4–6 pairs; petioles 5–10(–12) mm long. *Inflorescences*: axis and pedicels glabrous or rarely sparsely pilose; bracts gradually changing from orbicular at base to obovate at top, 3–4 mm long; bracteoles elliptic. *Flowers*: calyx limb 1.5–2.5 mm long; calyx lobes ovate to triangular, 1.5–2 mm long; stamens 20–35; style 5–7 mm long.

Jap. name: Aobana-hainoki

Distr. Japan (Ryukyu: Okinoerabu Is., Okinawa Is.), endemic.

JAPAN. **Ryukyu**. Kagoshima. Okinoerabu Is.: *S. Hatusima & Y. Miyagi 39112, 39310* (RYU); China, *H. Ohba 12* (KYO); Oyama, *T. Amano 6420* (KYO, RYU), *S. Hatusima & S. Sako 21498, 21500, 21572, 31008, 31010* (KAG, TI), *T. Shimizu 85-418* (KYO). — Okinawa. Okinawa Is.: *T. Miyagi 350* (KYO); Kushima, *Y. Tashiro* (TI, type); Kunigami, *S. Sakaguchi* (KYO); Benokigawa, *Z. Tashiro* (KYO); Sade, *S. Sakaguchi* (KYO), *S. Sonohara* (KYO); Tanyu-dake, Haji-mura, *T. Kinjo 1637* (RYU); Ibu-dake, *Z. Tashiro* (KYO); Meijiyama, Nago, *S. Hatusima 39338* (RYU); Nago-dake, 200–345 m, *H. Nagamasu 1662, 1665, 1994* (KYO); Yonaha-dake, *S. Sakaguchi* (KYO), *S. Tawada 285* (KYO), *M. Furuse 4896* (RYU); Nakagami, *Tashiro* (TI); Mt. Onnadake, 150 m, *S. Hatusima 17803* (RYU, TI).

7-2. var. **iriomotensis** Nagamasu, **var. nov.** — Plate 57a.

Laminae tenuiter coriaceae, 7–12 cm longae, 2.5–4 cm latae, venis primariis 6–7(–8) paribus. — Typus: *S. Mitsuta & H. Nagamasu 435* (KYO, Plate 57a), the river Yutsun to the pond Maboroshi-no-ike, Iriomote-jima Is., Okinawa Pref., 260–380 m alt. March 15, 1984.

Terminal buds subulate and often curved, 3–6 mm long, puberulous to glabrescent, margin of the scales ciliate. *Leaves*: blades thinly coriaceous, elliptic to narrowly elliptic, 7–12 cm long, 2.5–4 cm wide; margin with teeth 2–8 mm apart; nerves 6–7(–8) pairs; petioles 5–15 mm long. *Inflorescences*: axis and pedicels sparsely pilose to glabrescent, nodes often hairy; bracts gradually changing from ovate at base to obovate at top, 3–5 mm long, apex acute; bracteoles narrowly elliptic. *Flowers*: calyx limb 2–3 mm long, deeply divided to base, lobes ovate, triangular, narrowly elliptic; stamens 15–20 (30–45 in one specimen); style 7–9 mm long. *Fruits*: mature fruits unknown.

Jap. name: Iriomote-hainoki

Distr. Japan (Ryukyu: Iriomote Is.), endemic.

JAPAN. **Ryukyu**. Okinawa. Iriomote Is.: *Y. Miyagi 3553* (RYU); *F. Yamazaki et al.* (TI), *Y. Tateishi & J. Murata 4779, 4780A, 4780B* (TI); Urauchi River, 30–280 m, *H. Okada et al. 242, 245, 264, 301* (KYO), *H. Nagamasu 1611, 1613, 1620* (KYO), *S. Noshiro & M. Suzuki 5084* (KYO); Urauchi River to Mt. Tedoh, *S. Mitsuta & H. Nagamasu 611* (KYO); Mt. Komi, *Y. Miyagi 9705* (RYU); Yutsun River, 260–380 m, *S. Mitsuta & H. Nagamasu 430, 431, 434, 435, 437, 445, 446* (KYO); Nakama River, *S. Noshiro 5163* (KYO).

8. **Symplocos caudata** Wall. *ex* G. Don — Fig. 3-8, Map 8, Plate 57b–d, 58a–d.

S. caudata Wall. [Cat. 4413 (1830), *nomen nud.*] *ex* G. Don, Gen. Syst. 4: 3 (1837 or early 1838); A. DC., Prodr. 8: 256 (1844); Kurz, J. As. Soc. Beng. 46(2): 237 (1877); For. Fl. Br. Burma 2: 147 (1877); C.B. Clarke, Fl. Br. Ind. 3: 577 (1882); Brand, Pfl. R. Heft 6: 42 (1901); Brandis, Ind. Tr.: 440 (1906); Sargent, Pl. Wilson. 2: 595 (1916); Gontscharow, Not. Syst. Ross. 5: 103 (1904); Guillaumin, Bull. Soc. Bot. Fr. 71: 276 (1924); Fl. Gen. I.-C. 3: 1021 (1933); Fletcher, Fl. Siam. En. 2: 385 (1838); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 18 (1943); Li, J. Wash. Ac. Sc. 43: 107 (1953); Wood. Fl. Taiwan: 742 (1963); Hatusima, Fl. Ryukyus: 477 (1971); Ying, Bull. Exp. Forest Nat. Taiwan Univ.: 116 (1975); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, excl. pl. (1989). — Type: *Wallich 4413* (K-W, photo!, isotypes in BM! Plate 57b, CGE, E!, G-DC, L!, LE, NY, W!), Sylhet, India.

S. swinhoeana Hance, Ann. Soc. Nat. ser. 4(15): 226 (1861). — Type: *de Grijs in Herb. Hance 6697* (BM!, Plate 57c), Fu Kien.

S. caudata var. *maculata* Brand, Pfl. R. Heft 6: 42 (1901). — Type: *Warburg 5851* (K!, Plate 57d), Mt. Kushan, Futschau, South China.

S. somai Hayata, Ic. Pl. Form. 9: 69 (1919); Mori, Sylvia 5: 244 (1934); Kahehira, Form. Tr. (ed. 1936): 599, t. 556. — *Bobua somai* Kanehira & Sasaki, List Pl. Form.: 332 (1928); Sasaki, Cat. Govt. Herb.: 408 (1930). — Type: *T. Soma s.n.* (TI!, Plate 58a), Dec. 1915, Daikwakei, Toyencho, Formosa.

S. sozanensis Hayata, Ic. Pl. Form. 9: 70 (1919); Mori, Sylvia 5: 244 (1934); Kanehira, Form. Tr. (ed. 1936): 599, t. 557. — *Bobua sozanensis* Kanehira & Sasaki, List Pl. Form.: 332 (1928); Sasaki, Cat. Govt. Herb.: 408 (1930). — Type: *Y. Shimada s.n.* (TI!, Plate 58b), July 1918, Sozan, Formosa.

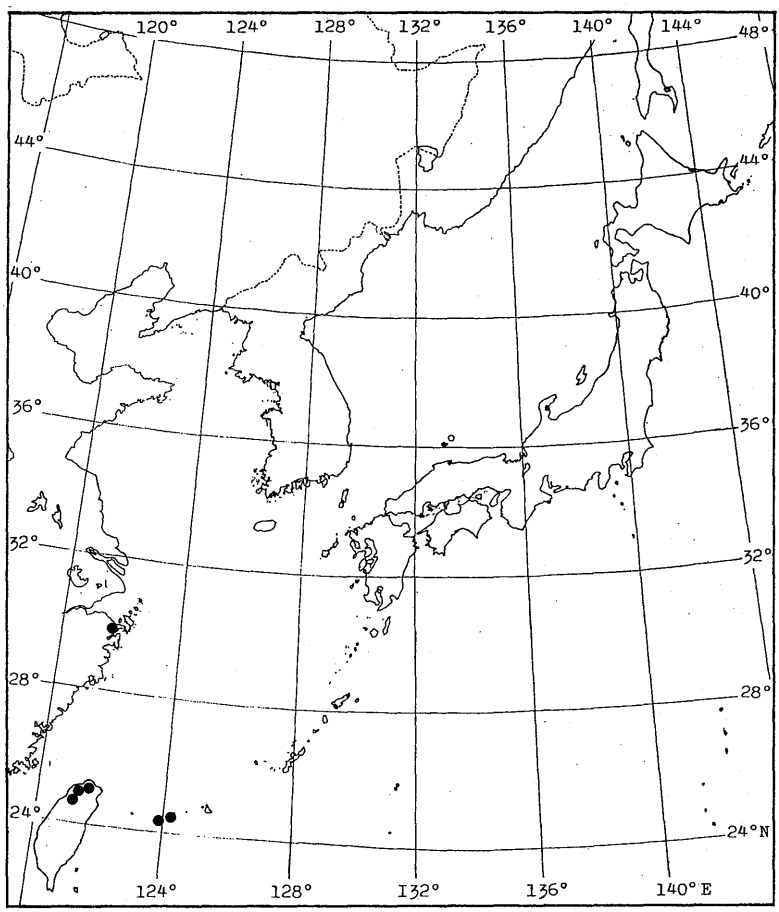
S. yaeyamensis Masamune, Trans. Nat. Hist. Soc. Form. 30: 61 (1940). — Type: *Takamine N.F. 6913* (TAI, *non vidi*), Kare-zan, Ishigaki Is., Ryukyu Isls., Japan.

Bobua austrosinensis Migo, Bot. Mag. Tokyo 56: 267 (1942). — Type: *McClure CCC13164* (SH, *non vidi*, isotype in KYO!, Plate 58d), near Kong Ts'eun, little North river, Kwangtung.

S. sumuntia auct. *non* Buch.-Ham. *ex* D. Don: Nooteboom, Leid. Bot. Ser. 1: 284 (1975), *p. min. p.*

S. prunifolia auct. *non* Sieb. & Zucc.: Walker, Fl. Okinawa South. Ryukyu Is.: 832 (1976), *p.p.*

Evergreen trees; bark brown, smooth. Twigs dark brown, terete; young twigs brown, puberulous and densely to sparsely pilose to glabrescent. Terminal buds subulate, 3–6 mm long, apex often curved, puberulous and densely to sparsely pilose. *Leaves*: blades coriaceous, elliptic to narrowly elliptic, rarely ovate, 4–8 cm long, 2–4(–5) cm wide; apex caudate with apiculate tip; base cuneate-attenuate; margin slightly recurved, crenate-serrate with teeth 2–5(–7) mm apart; both surfaces glabrous, or sparsely hairy on the midrib on lower surface; midrib impressed on upper surface, prominent on lower surface; nerves 5–7 (–8) pairs, slightly prominent on both surfaces; reticulation fine, often slightly prominent on both surface; petioles glabrous, or puberulous and/or sparsely pilose, 5–8 mm long. *Inflorescence* axillary, a simple raceme, 5 to 10-flowered, 1–3(–4) cm long, axis and pedicels pilose, often with minute bristly hairs; pedicels 1–4(–8) mm; bracts gradually changing from orbicular at base to obovate at top, apex obtuse and abruptly acute, meniscoid to boat-shaped, 2–3 mm long, caducous, inside glabrous, outside appressed hairy, margin ciliate;



Map 8. Distribution of *Symplocos caudata* Wall. *ex* G. Don.

bracteoles 2, narrowly elliptic to lanceolate, boat-shaped, 1.5–2 mm long, apex acute, margin ciliate, often glandular denticulate near base, inside glabrous, outside with same indument as bracts. *Flowers*: calyx tube glabrous, 1–1.5 mm high; calyx limb 1–2 mm long; calyx lobes ovate to narrowly ovate, 1–1.5 mm long, the apex acute or obtuse; outside appressedly hairy at least near the apex; corolla white, deeply 5-lobed, 3–4 mm long, the lobes elliptic; stamens 35–60, connate at base; disk annular, glabrous; style glabrous, 4–5 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* ampulliform, 5–7(–10) mm by 3–4(–5) mm, crowned by persistent calyx lobes; stone ampulliform, smooth to slightly grooved; mesocarp thin; seed 1, curved, with curved embryo. *Pollen grains* 3-colporate, semiangular in polar view, oblate to suboblate in equatorial view; tectum densely finely verrucate; colpi very short; ora circular to transversely elliptic; 22.7 μm (P) × 29.4 μm (E); pollen type IIb. —Flowers: Nov.–Dec. Fruits: mature fruits unknown.

Jap. name: Yaeyama-kurobai

Habitat. Subtropical evergreen forests.

Distr. Japan (Ryukyu: Ishigaki & Iriomote Isls.), Taiwan, China, Indochina, Thailand, ?Burma, India, Malay Peninsula.

JAPAN. **Ryukyu**. Okinawa. Ishigaki Is.: Kare-san, *S. Tawada 289* (KYO), *G. Koidzumi* (KYO, Plate 58c), *E. Takamine 227* (KYO); Banna-dake, 150 m, *T. Yamazaki 22105* (KYO, TI), *H. Nagamasu 1087, 1095, 1098, 1103, 1141* (KYO); Mt. Omoto-dake, *Y. Niiro 2053* (RYU), *M. Furuse 2397* (RYU); Mt. Fukaiomoto, 100 m, *G. Ikeda 4388* (RYU). Iriomote Is.: *S. Sonohara 1239* (RYU), *G. Koidzumi* (KYO); Aira River, *Y. Miyagi 9744* (RYU, TI), Urauchi-gawa, *H. Nagamasu 1325, 1327* (KYO).

TAIWAN. Taipei Co.: Neihu, *C.M. Kuo 9284* (KYO, TI). — Taoyuan: *T. Soma* (TI). — Xinzhu: Hetin, *Y. Shimada 1180* (TI). Okaseki, *Faurie 182* (KYO, TI).

CHINA. Zhejiang: Ningpo, *C.W. Everard* (KYO). — Guangdong: Sha Lo Shan, Sin-fung District, *Y.M. Taam 169* (KYO); Tai Mo Shan, Tapu District, *W.T. Tsang 21063, 21138* (KYO). — Hainan.: *S.K. Lau 27001* (KYO); Chim Fung Mt., near Sha Mo Kwat Village, Kan-en District, *S.K. Lau 4974* (KYO).

INDOCHINA. Annam: Blao Prov., Haut Donnai, 800 m, *Poilane 22247 (KYO)*. — Cambodia: Cheko, Koh Kong, near Sihanoukville, *T. Kira et al. 1065* (KYO).

THAILAND. Loei: Phu Kradung, 900–1250 m, *T-22662, 22693, 23056, 23192, 31320, 40193, 40258, 42306, 42914* (KYO). — Nakon Ratchasima: Kao Yai, 650–1050 m, *T-19697, 35037* (KYO). — Chaiyaphum: Tunkamang, 800 m, *van Beusekom et al. 4276* (KYO). — Chiang Mai: Doi Inthanon, 1020 m, *T-35395* (KYO). — Payap: Sop Aep village – Pa Mon village, *E. Hennipman 3372* (KYO).

INDIA. Sylhet: *Wallich 4413* (BM, E, W).

MALAY PENINSULA. Pahang: Gunung Tahan, *Ridley 16079* (SING); Cameron Highland, *Asakusa* (SING).

9. **Symplocos prunifolia** Sieb. & Zucc. — Fig. 3-9 & 4g, Map 9, Plate 59a–d.

S. prunifolia Sieb. & Zucc., Fam. Nat. 2: 133 (1846), Miq., Prol. Fl. Jap.: 265 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 308 (1875); Forbes & Hemsley, J. Linn. Soc. Bot. 26: 74 (1889); Hand.-Mazz., Beih. Bot. Centralbl. 62B: 22 (1943), *p.p.*; Walker, Imp. Tr. Ryukyu Is.: 266 (1954); Ohwi, Fl. Jap.: 933 (1953); *ibid.* English ed.: 727 (1965); Hatusima, Fl. Ryukyus: 477 (1971); Kitamura & Murata, Wood. Fl. Jap. 1: 97, t. 114 (1971); Walker, Fl. Okinawa South. Ryukyu Is. : 832, t. 167 (1976), *p.p.*; Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 273, pl. 192-1 & 2 (1989); Shimabuku, Check List Ryukyu Is.: 354 (1990). — *Bobua prunifolia* Miers, J. Linn. Soc. Bot. 17: 306 (1879); Nakai, Tr. & Shr. ed. 1: 235, t. 131 (1922); Fl. Sylv. Koreana 13: 36, t. 11 (1923); Masamune, Fl. & Geo. Yakus.: 365 (1934). — *Dicalix prunifolius* Hara, Enum. Sperm. Jap. 1: 107 (1948). — Type: *von Siebold* (L!, Plate 59a), Japan.

S. prunifolia var. *paucistaminosa* Gontscharow, Not. Syst. Ross. 5: 104 (1924). — Type: *Fortune 25* (BM! Plate 59b, K!, P, W!), China borealis. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 285 (1975)).

S. prunifolia var. *uiae* Makino, J. Jap. Bot. 3: 10 (1926); Ohwi, Fl. Jap.: 933 (1953). — *Bobua prunifolia* var. *uiae* Nakai, Tr. & Shr. ed. 2: 319 (1927). — *B. uiae* Nakai, Bot. Mag. Tokyo 43: 448 (1929). — *B. prunifolia* forma *uiae* Sugimoto, Key Tr. & Shr. Jap.: 323 (1936). — *Dicalix prunifolius* var. *uiae* Hara, Enum. Sperm. Jap. 1: 107 (1948). — *S. prunifolia* forma *uiae* Ohwi, Fl. Jap. English ed.: 727 (1965), *nomen nud.* — Lectotype: *N. Ui* (TI!), Inari Prov., Kii, Japan, 15 May 1925 (designated here).

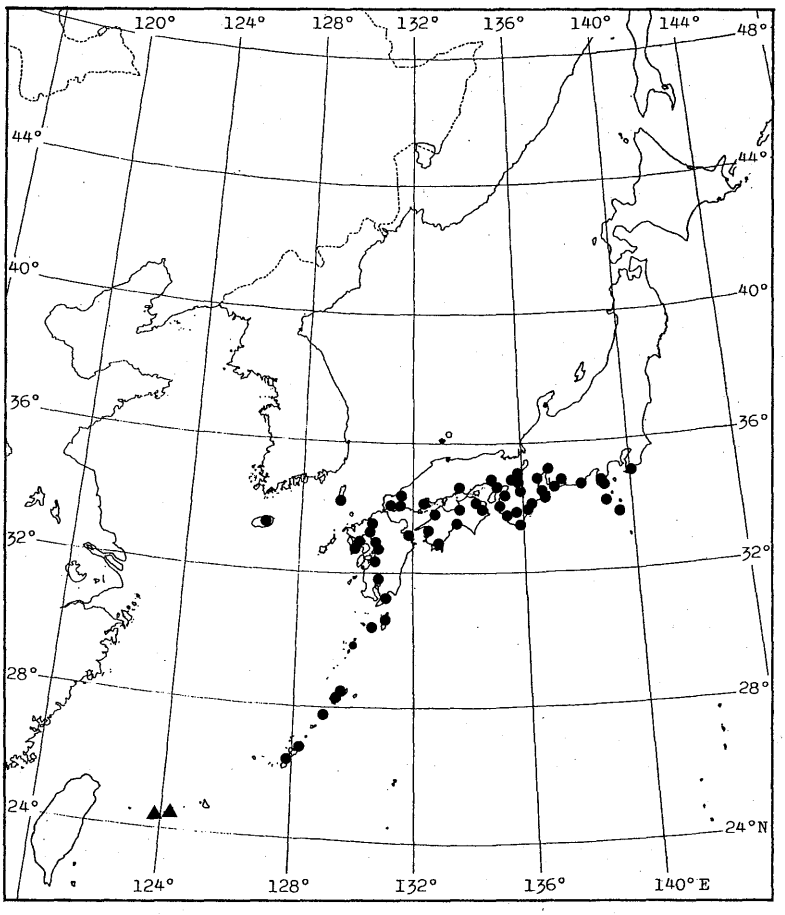
S. caudata auct. *non* Wall. *ex* G. Don: Brand, Pfl. R. Heft. 6: 42 (1901), *p.p.*; Matsumura, Ind. Pl. Jap. 2(2): 485 (1912).

S. caudata var. *maculata sensu* Brand, Pfl. R. Heft 6: 42 (1901), *p.p.*

S. sumuntia auct. *non* Buch.-Ham. *ex* D. Don: Nooteboom, Leid. Bot. Ser. 1: 284 (1975); Wu, Fl. Reip. Pop. Sin. 60(2): 22 (1987).

Evergreen trees; bark gray-violet, smooth. Young twigs ridged below petioles, glabrous, gray, later gray-violet. Terminal buds glabrous; apex acute to caudate, often curved, 5–10 mm long. *Leaves*: blades coriaceous, narrowly elliptic to narrowly oblong, 4–12 cm

long, 2–3 cm wide; apex caudate, base cuneate to acute; margin slightly recurved, undulate-serrate with teeth 2–5 mm apart; both surfaces glabrous; midrib impressed on upper surface, prominent on lower surface; nerves 7–12 pairs, slightly prominent on lower surface; reticulation coarse; petioles often tinged red, 8–15 mm long. *Inflorescence* axillary, a simple raceme, forming a globose cone in buds, rather densely 10 to 30-flowered, (2–)3–8 cm long, axis and pedicels puberulent; pedicels 0.5–4 mm long; bracts orbicular to elliptic, boat-shaped, 3–5 mm long, caducous, inside glabrous, outside glabrescent, margin ciliolate or glabrous; bracteoles 2, ovate, 1.5–2.5 mm long, caducous, inside glabrous, outside pilose, margin ciliate. *Flowers*: calyx tube glabrous, 1.5 mm high; calyx lobes imbricate, glabrous, semicircular to ovate with ciliate margin, 1–1.5 mm long; corolla white, deeply 5-lobed, 4–6 mm long, lobes elliptic; stamens 25–35, indistinctly pentadelphous; disk annular, glabrous; style 4–5 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* black, narrowly ovoid to ellipsoid, 6–8 mm long, 3–4 mm in diameter, crowned by persistent calyx lobes; stone narrowly ellipsoid, smooth, 6–7 mm by 2–3 mm, mesocarp thin; seed 1, straight with



Map 9. Distribution of *Symplocos prunifolia* Sieb. & Zucc. Var. *prunifolia* (disk) and var. *tawadae* Nagamasu (triangle). A small disk is based on the literature.

endosperm and straight embryo. *Pollen grains* (2–)3(–4)-colporate, subangular to semilobate in polar view, oblate in equatorial view; tectum finely corrugate and partly verrucate; colpi very short; ora transversely elliptic; 20.3–23.5 μm (P) × 28.8–34.1 μm (E); pollen type IIc. —Flowers: Mar. (Ryukyu), Apr.–early May. Fruits: Oct.–Nov.

Jap. name: Kurobai

Habitat. Subtropical to warm-temperate evergreen forests.

Distr. Japan (Honshu, Shikoku, Kyushu, Ryukyu), Korea (Jeju Is.), China.

Notes. 1. This species is closely related to *S. heishanensis* Hayata of Taiwan. The latter differs from *S. prunifolia* by having smaller bracts (2–3 mm long) and narrower and thinner leaves.

2. Several collections from around Tanabe-shi, Wakayama Pref. (with asterisk in the list of *S. prunifolia* var. *prunifolia*), have orbicular leaves and short racemose inflorescences. The plants of this form have been treated as a distinct species, *S. uiae*, or a variety or a form of *S. prunifolia*. The stamens are only four, and the lower part of the style is obliquely swollen with undeveloped ovules (*i.e.* the ovary is superior to semi-inferior!). I visited Tanabe-shi and searched for this plant, but only found that the usual form of *S. prunifolia* is common, there. Thus, it does not seem that this form represents a local variety of *S. prunifolia*. All collections of this form were made in 1924 or 1925, soon after the first discovery by Mr. N. Ui on 5 May 1924, and might been collected from the same tree. I treat this taxon as a monstrous form of *S. prunifolia* var. *prunifolia*, because it has unusual floral characters in the genus.

Key to the varieties

1a. Blades 4–9 cm long, nerves 7–9(–10) pairs. ..... 9-1. var. *prunifolia*
1b. Blades 7–12 cm long, nerves 9–12 pairs. ..... 9-2. var. *tawadae*

9-1. var. **prunifolia**

All synonyms.

Terminal buds about 5 mm long. *Leaves*: blades 4–8 cm long, 2–3 cm wide; nerves 7–9(–10) pairs; petioles 8–15 mm long. *Inflorescences* (2–)3–8 cm long. *Flowers*: calyx lobes about 1 mm long; corolla 4–5.5 mm long; style about 4 mm long. *Fruits* 6–7 mm long; stone narrowly ellipsoid, smooth, about 6 mm by 2 mm. —Flowers: Mar. (Ryukyu), Apr.–early May. Fruits: Oct.–Nov.

Jap. name: Kurobai

Distr. Japan (Honshu, Shikoku, Kyushu, Ryukyu: south to Okinawa Is.), Korea (Jeju Is.), China.

JAPAN. **Honshu**. Chiba: Nigorikawa, Experimental Forest, Honda (TI); Mt. Kiyosumi, *Honda* (TI), *T. Tuyama & S. Takahashi* (TI); Mt. Uchiurayama, Awakominato, < 300 m, *H. Ohba et al. 6808043* (TI).—Tokyo. Izu Isls.: Mikurajima Is., *N. Satomi 20375* (TI), *H. Ohba 677060* (TI); Kozushima Is., Tenzyozan, 450 m, *T. Yamazaki* (TI).—Shizuoka: Yugashima, *Y. Momiyama 995* (TI); Suzaki, Izu, *H. Hara* (TI); Nanjo-mura, Kamo-gun, *Y. Kimura* (TI); Goka-mura, Haibara-gun, *J. Sugi-*

moto. — Aichi: Kenkoji, *H. Muramatsu* (TI); Higashiyama, Nagoya, *F. Maekawa 180443*; Ichinomiya-mura, Mikawa, *K. Torii 8936* (TI). — Mie: Kosugi, Mie-mura, *N. Yasui* (KYO); Gegu, Ise, *H. Kanai* (TI); Hamashima, Shima, *H. Hara & S. Kurosawa* (TI); Akabane, Kitamuro-gun, *Y. Tsukamoto* (KYO); Owase-shi, *M. Furuse 20* (TNS). — Kyoto: Yoshida-yama, *G. Koidzumi* (KYO, TI), *Z. Tashiro* (KYO); Daimonji-yama, *G. Koidzumi, N. Fujita 720* (KYO); Nanzenji, Kyoto, *M. Tagawa 7207* (KYO, W); Momoyama, *G. Nakai* (KYO); Tennozan, *G. Murata 22299* (KYO), 200 m, *44522* (KYO). — Osaka: Mikita-jinja, Sakai-shi, *M. Okamoto 1202* (KYO); Shakudai, Shimamoto-cho, Mishima-gun, *G. Murata 45622* (KYO). — Hyogo: Yamamoto, Settsu, *M. Togashi TSM1043* (KYO, TI, W); Taisanji, Tarumi-ku, Kobe-shi, 100 m, *N. Kurosaki 8084* (KYO); Taisanji, Akashi-shi, *S. Hosomi 17116* (KYO), *Z. Tashiro* (KYO); Ichijoji, Sakamoto-cho, Kasai-shi, 200 m, *N. Fukuoka 8795* (KYO). — Nara: Kasuga-yama, *Anonymous* (TI). — Wakayama: Oshima, *I. Namikawa* (KYO); Kizetsukyo, *S. Nishimura* (KYO); Tanabe-cho, Ryujin-yama, *T. Yamamoto* (KYO); Tanabe-cho, *T. Nakajima* (KYO); Inari-mura, Nishimuro-gun, **N. Ui* (KYO, TI), **N. Ui 9409* (TI, Plate 59c), **T. Nakajima* (TI); Tanabe-cho, Nishimuro-gun, **K. Matsushima TNS37083, 37084* (TNS), **T. Nakajima* (KYO, TNS); Seto, Kanayama-mura, **K. Nakajima TNS37085* (TNS); Goboyama, Wakayama-shi, *T. Nakajima* (TI). — Okayama: Sogo, Hinase-cho, Wake-gun, 40–200 m, *N. Fukuoka & N. Kurosaki 4159* (KYO). — Hiroshima: Miyajima, *B. Hayata* (TI), *G. Koidzumi* (TI). — Yamaguchi: Nago, Abu-gun, *K. Oka 8548* (TNS), *8549* (KYO); Fukagawa-cho, Otsu-gun, *F. Tamai TNS50956 (TNS)*; Narutaki, Kosaba-mura, Yoshiki-gun, *J. Nishina 744* (TNS); Miyano-mura, Yoshiki-gun, *J. Nishina TNS260799* (TNS). **Shikoku**. Tokushima: Mayuyama-koen, Tokushima-shi, *T. Inobu 5* (KYO). — Kagawa: Hiketa-machi, Okawa-gun, *M. Takahashi 1687* (KYO, TI). — Ehime: Izumi, Futaiwa-mura, Nishiuwa-gun, *Y. Nomura 16* (KYO). — Kochi: Godai-san, *M. Tagawa 846* (KYO); Ida, Hata-gun, *K. W.* (TI); Ahioeyama, *Yoshinaga* (TI). **Kyushu**. Fukuoka: Kasuga, *K. Nakajima 787* (TNS); Takara-yama, Kurume-shi, 200 m, *J. Ouchi 9884* (RYU); Nakahirokawa-mura, Yame-gun, *Anonymous TNS31129* (TNS). — Nagasaki: Yasuman-dake, Hirado, *Z. Tashiro* (KYO, TI); Michinoo, Urakami, *Z. Tashiro* (KYO); Omura, *S. Toyama 20030, 23315* (TNS); Isahaya, *Y. Yokoo 10* (KYO). Tsushima: *Faurie 4815* (KYO, W); *C. Wilford* (W). — Kumamoto: Shodai-san, *Z. Tashiro* (KYO); Nishize, *K. Maebara* (KYO); Mt. Kimbo-san, *H. Kozuma ATNS22756* (KYO). — Oita: Kamato-hanto, *Z. Kiyohara* (KYO); Ochinoura, Youra, Kitaamabe-gun, *Z. Kiyohara* (KYO). — Miyazaki: Mt. Osuzu-yama, 400 m, *F. Yamazaki* (TI). — Kagoshima: Sendai-shi, *H. Yahata* (RYU); Takuchi, Higashisonoyama-mura, Aira-gun, *Z. Tashiro* (KYO); Mt. Hoyoshi-dake, *Y. Momiyama* (TI); Mt. Takakuma, *K. Hasegawa* (TI). Yakushima Is.: Shirotani-rindo, 300–500 m, *K. Deguchi 4843* (KYO); Isso, 150–250 m, *G. Murata et al. 664* (KYO); Mt. Mottchomu, 200–350 m, *H. Doei & H. Nagamasu 50* (KYO); Hanayama trail, 900 m, *G. Murata et al. 569* (KYO, TI); Hanayama, 50–150 m, *H. Takasaki 80040* (KYO), 1150–1300 m, *J. Murata et al. 17866* (TI); Ambo to Kosugidani 400 m, *S. Mitsuta et al. 391* (KYO). **Ryukyu**. Kagoshima. Amami-Oshima: Naze–Yamamoto, *G. Koidzumi* (KYO); Yamato-son, 200 m, *S. Sako 5133* (KAG, KYO, RYU); Mt. Yuwan-dake, *T. Amano 6485* (RYU). Tokunoshima Is.: Mt. Inokawa-dake, 400 m, *H. Nagamasu 1767* (KYO); Mt. Intabu, Isen-cho, *Y. Miyagi & Hatusima 39750* (RYU). — Okinawa. Okinawa Is.: Benokiyama, *S. Sonohara 1240* (RYU); Sade, *G. Koidzumi* (KYO); Maji-yama, Kunigami, *Tashiro* (TI); Mt. Nishime-dake, 350–420 m, *H. Nagamasu 2022* (KYO); 200–300 m, *G. Murata et al. 56714* (KYO); Mt. Yonaha-dake, 400–500 m, *N. Kurosaki 3808* (KYO), *S. Mitsuta & H. Nagamasu 727* (KYO); Yona to Aha, 150 m, *H. Nagamasu 1651* (KYO); Onna, *E. Takamine 2526* (RYU); Naha, *Tanaka* (TI).

KOREA. Jeju-do: *Faurie 1889* (KYO, W), *K. Katakura* (KYO), 800 m, *Taquet 6248* (TI); in sylvis Hongno, *Taquet 284* (KYO, W); in sylvis Yangkwin, 700 m, *Taquet 1107* (KYO, TI).

CHINA. China borealis, *Fortune 25* (BM, K, W).

Note. This species is also reported from Nakanoshima Is. of Tokara Isls. (Hatusima, 1986: 131).

9-2. var. **tawadae** Nagamasu, **var. nov.** — Plate 59d.

Laminae 7–12 cm longae, venis primariis 9–12 paribus. – Typus: *S. Mitsuta & H. Nagamasu 424* (KYO, Plate 7d), the river Yutsun to the pond Maboroshi-no-ike, Iriomote-jima Is., Okinawa Pref., 260–380 m alt. March 15, 1984.

Terminal buds 5–10 mm long. *Leaves*: blades 7–12 cm long, 2–3 cm wide; nerves 9–12 pairs; petioles 10–15 mm long. *Inflorescences* 4–8 cm long. *Flowers*: calyx lobes 1–1.5 mm long; corolla 5–6 mm long; style 4–5 mm long. *Fruits* 6–8 mm long; stone narrowly ellipsoid to narrowly ovoid, smooth, 6–7 mm long, 2–3 mm in diameter. —Flowers: March. Fruits: mature fruits unknown.

Jap. name: Nagaba-kurobai

Distr. Japan (Ryukyu: Ishigaki Is., Iriomote Is.), endemic.

JAPAN. **Ryukyu**. Okinawa. Ishigaki Is.: *G. Koidzumi* (KYO), *E. Takamine 2013* (RYU); Maedake, *E. Takamine 2209* (RYU); Nagura-gawa, *M. Furuse 2570* (RYU); Banna-dake, 70–230 m, *H. Nagamasu 1142* (KYO); Mt. Omoto-dake, 100–526 m, *H. Nagamasu 970* (KYO), *T. Amano 7669* (RYU). Iriomote Is.: *G. Koidzumi* (KYO); Sonai, *Tanaka 349* (TI); Omizugawa, *S. Tawada* (KYO); Shirahama to Mt. Antena-yama, 100 m, *H. Okada & K. Ueda 2742* (KYO, RYU, TI); Nakama-gawa, Goza-take, 200 m, *T. Yamazaki 2913* (TI); Kampira fall, *M. Furuse 1928* (RYU), *F. Yamazaki* (TI); Yutsun River to Maboroshi-no-ike, 260–380 m, *S. Mitsuta & H. Nagamasu 424, 433* (KYO); Omija River, *H. Okada & K. Ueda 2812* (KYO, RYU); Urauchi River, 100 m, *S. Hatusima 18606* (RYU, TI), 120–220 m, *H. Nagamasu 1616, 1626* (KYO); Mt. Komi-dake, *Hatusima 33027* (RYU), *Y. Miyagi 9607* (RYU).

Sect. 3. **Bobu** (Adanson) Brand

Key to the species

1a. Young twigs green, glabrous; leaves narrowly obovate to narrowly oblong, 12–18 cm long. ..... 10. *S. konishii*

1b. Young twigs brown, more or less hairy; leaves elliptic, narrowly elliptic or narrowly oblong.

2a. Leaves 14–25 cm long; nerves distinctly prominent on lower surface; calyx lobes 1.5–2(–2.5) mm long, forming a beak on top of fruits. ..... 11. *S. cochinchinensis*

2b. Leaves 7–15 cm long; nerves slightly prominent on lower surface; calyx lobes 0.5–1 mm long, not forming a beak on top of fruits. ..... 12. *S. theophrastifolia*

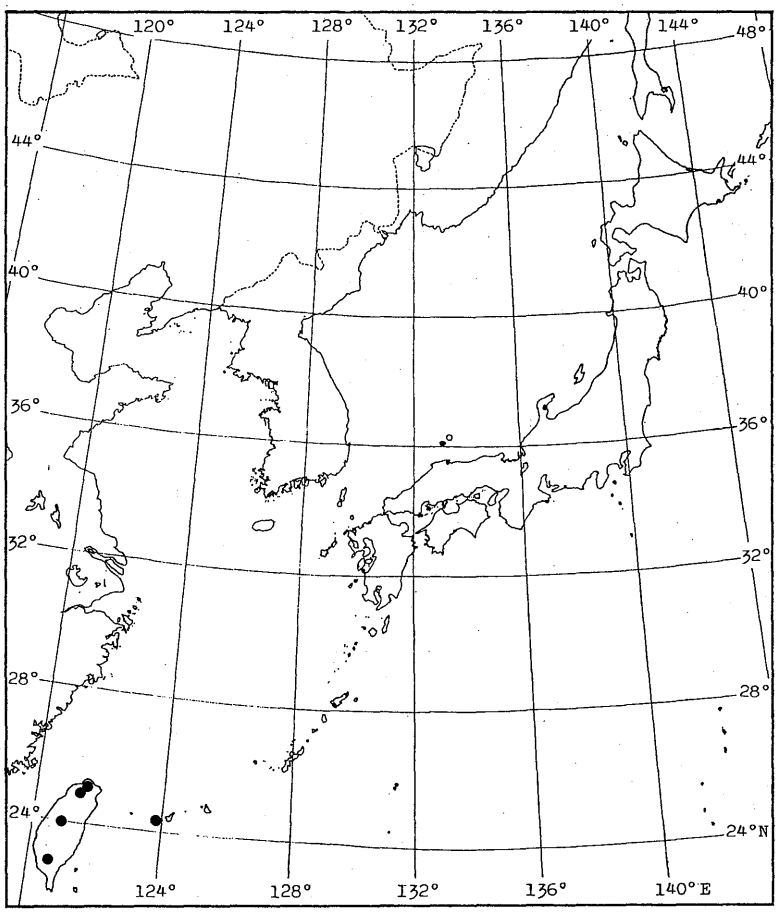
10. **Symplocos konishii** Hayata —Fig. 3-10, Map 10, Plate 60a–b.

S. konishii Hayata, Icon. Pl. Form. 5: 105,. t. 25a (1915); Mori, Sylvia 5: 234 (1935); Kanehira, Form. Tr. rev. ed.: 590, t. 548 (1936); Liu, Lign. Pl. Taiwan: 1049, t. 873 (1962); Li, Wood. Fl. Taiwan: 737 (1963); Hatusima, Fl. Ryukyus (ed. 1975): 887, Wu, Fl. Reip. Pop. Sin. 60(2): 56 (1987). —*Bobua konishii* Kanehira & Sasaki, Cat. Govt. Herb.: 407 (1930). —Type: *Anonymous* (TI!, Plate 60a), in montibus Kusshaku, Taiwan, Jun. 1907 (Fr.).

S. cochinchinensis ssp. *laurina* auct.: Nooteboom, Leid. Bot. Ser. 1: 156 (1975); in Li et al., Fl. Taiwan 4: 118 (1978); Shimabuku, Check List Ryukyu Is.: 352 (1990).

S. spicata auct. *non* Roxb.: S.-S. Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 557 (1975).

Evergreen trees. Twigs gray-brown, terete; young twigs thick, green, glabrous, ridged below petioles. Terminal buds obliquely ovoid, rusty tomentose to pubescent; apex acuminate, often slightly curved. *Leaves*: blades coriaceous, narrowly obovate to narrowly oblong, 12–18 cm long, 4–6 cm wide; apex acuminate; base cuneate to short attenuate; margin often slightly recurved, glandular-dentate with teeth 3–5(–6) mm apart; upper surface shining, glabrous; midrib impressed on upper surface, very prominent on lower surface; nerves 8–10 pairs, prominent on both surfaces; petioles glabrous, adaxially sulcate, 15–25 mm long. *Inflorescence* axillary, a spike usually branched at base, (2.5–)3–5(–6) cm long, axis pubes-



Map 10. Distribution of *Symplocos konishii* Hayata.

cent; bracts depressed ovate, 1.5–2 mm long, apex obtuse to acute; bracteoles 2, depressed ovate to kidney-shaped, about 1.5 mm long, apex obtuse to acute; both persistent, keeled, adaxially glabrous, abaxially pubescent, margin ciliate. *Flowers*: calyx tube glabrous, 0.5–1 mm high; calyx lobes imbricate, ovate, 1–1.5 mm long, apex obtuse, abaxially appressed pubescent, margin ciliate; corolla white, about 5 mm long, deeply 5-lobed, lobes narrowly elliptic; corolla tube about 1 mm long; stamens 60–70, shortly monadelphous to indistinctly pentadelphous; disk annular, later pulvinate, glabrous; style glabrous, about 5 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* globose to ampulliform, 5–6 mm in diameter, persistent calyx lobes surrounding pulvinate disk; stones ampulliform, slightly grooved, 4–5 mm long, 4–5 mm in diameter; mesocarp thin; endocarp woody; seed 1, twice curved, with similarly curved embryo. *Pollen grains* 3-porate or 3-colporate, circular to semiangular in polar view, suboblate in equatorial view; tectum spinulate; colpi indistinct, outline of ektoaperture vague; ora circular; 22.8 μm (P) × 27.4 μm (E); pollen type IId. — Flowers: Sept.–Oct. Fruits: ? Nov. (following year).

Jap. name: Konishi-hainoki

Habitat. Subtropical evergreen forests.

Distr. Japan (Ryukyu: Iriomoto Is.), Taiwan.

JAPAN. **Ryukyu**. Okinawa. Iriomote Is.: Yutsun River, 0–250 m, *H. Okada et al. 320* (KYO); Urauchi River, *T. Yamazaki* (TI), 20–100 m, *S. Mitsuta & H. Nagamasu 545* (KYO, Plate 60b); Kannabaru-goya, *M. Furuse 4086* (RYU); Aira River, *Y. Miyagi 9741* (KYO, RYU, TI); Mt. Komi-dake, 200–300 m, *Hatusima et al. 35264, 33088* (RYU).

TAIWAN. *S. Nakai & J. Tanaka* (TI). — Taipei: in montibus Kusshaku, *Anonymous* (TI). — Taoyuan: from Mt. Peitzatenshan (Takaishan) to Shauurai, Fushin-shi, 740 m, *M. Minaki et al. 2128* (KYO). — Chiayi: Heishana–Jujiro, *B. Hayata* (TI). — Kaohsiung: Qishan, *Y. Yamamoto & K. Mori* (TI).

Note. Plants in Taiwan have thinner leaves, more prominent veins on lower surface and more distinct serration than those in Iriomote Is.

11. **Symplocos cochinchinensis** (Lour.) S. Moore — Fig. 3-11, Map 11, Plate 61 & 62a.

S. cochinchinensis (Lour.) S. Moore, J. Bot. 52: 148 (1914); Guillaumin, Bull. Soc. Bot. Fr. 71: 277 (1924); Fl. Gen. I.-C. 3: 998 (1933); Merr., Comm. Lour.: 304 (1935); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 32 (1943); Li, J. Wash. Ac. Sc. 43: 107 (1953); Liu, Lign. Pl. Taiwan: 1045, t. 869 (1962); Li, Wood. Fl. Taiwan: 738 (1963); Hatusima, Fl. Ryukyus: 476 (1971); Nooteboom, Leid. Bot. Ser. 1: 1441 (1975); Walker, Fl. Okinawa South. Ryukyu Is.: 833, t. 164 (1976); Nooteboom in Li et al., Fl. Taiwan 4: 114 (1978); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173 (1989), pl. 192-3, *excl. syn. S. patens*; Shimabuku, Check List Ryukyu Is.: 352, *excl. subsp. laurina* (1990). — *Dicalix cochinchinensis* Lour., Fl. Cochinch. 1: 660 (1790), *excl. syn. Arbor rediviva* Rumph. — *S. spicata* (*non* Roxb.) H. Heine, Pfl. Samml. Clemens Kinabalu: 89 (1953). — Type: *Loureiro s.n.* (BM!, Plate 60c), Cochinchina.

S. loha Buch.-Ham. *ex* D. Don, Prod. Fl. Nepal: 144 (1825); G. Don, Gen. Syst. 4: 2 (1837 or 1838); DC., Prod. 8: 255 (1844). — *Lodhra loha* Miers, J. Linn. Soc. Bot. 17: 298 (1879). — Lectotype: *Hamilton 'Symplocos? subspinosa'* (BM!, Plate 60d), Nepal, Narainhetty. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 142 (1975)).

Dicalix javanicus Bl., Bijdr.: 1117 (1826). — *S. javanica* Kurz, J. As. Soc. Beng. 40(2): 64 (1871); Form., Fl. Burma: 145 (1877); J. As. Soc. Beng. 46(2): 239 (1877), *excl. syn. S. rubiginosa*; Sargent, Pl. Wils. 2: 597 (1916). — *Lodhra javanica* Miers, J. Linn. Soc. Bot. 17: 302 (1879). — *S. cochinchinensis* var. *javanica* S.-S. Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 559 (1975). — Type: *Blume s. n.* (BO!, Plate 61a), Java.

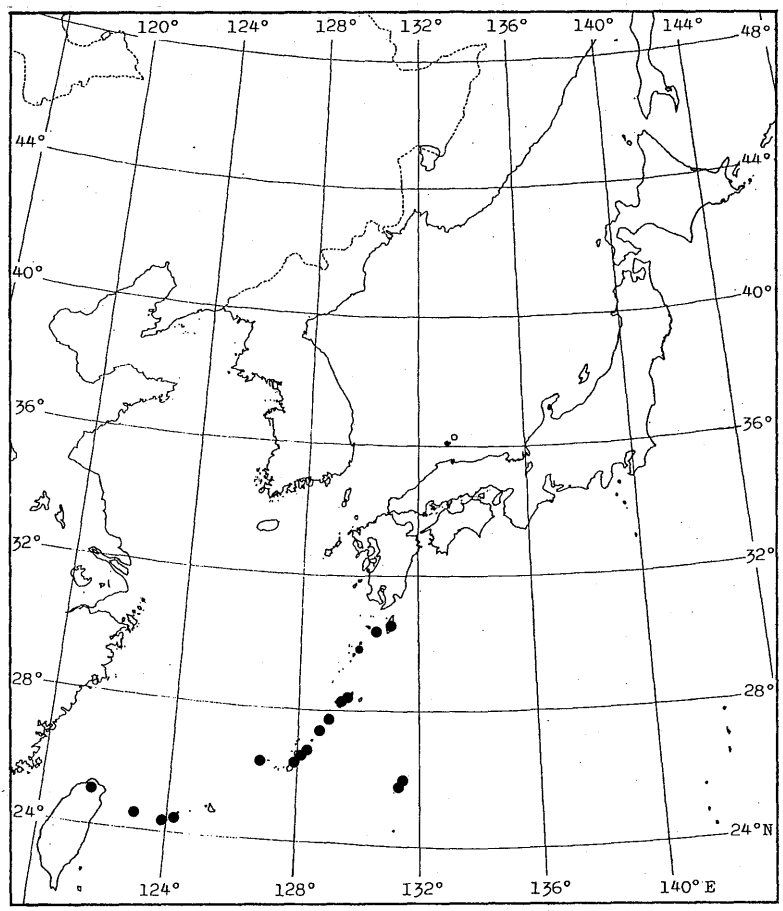
S. ferruginea Roxb., [Hort. Beng.: 40 (1814), *nomen*; Wall., Cat.: 4412 (1831), *nomen*] Fl. Ind. ed. Carey 2: 542 (1832); G. Don, Gen. Syst. 4: 2 (1837 or 1838); DC., Prod. 8: 257 (1844); Brand, Pfl. R. Heft 6: 40 (1901); Ridley, Fl. Mal. Pen. 2: 302 (1923); Fletcher in Craib, Fl. Siam. Enum. 2: 386 (1938). — *Lodhra ferruginea* Miers, J. Linn. Soc. Bot. 17: 299 (1879). — *Eugeniodes ferrugineum* O. K., Rev. Gen. Pl. 2: 975 (1891). — Type: *Roxburgh s. n.* (BM!, Plate 61b), Assam, Garo Hills, 1813.

S. mollis Wall. [Cat.: 4433 (1831), *nomen*] *ex* G. Don, Gen. Syst. 4: 3 (1837 or 1838). — Type: *Wallich 4433* (K-W, microfiche!, isotypes in BM, CGE, LE, NY, W!), Penang.

S. spicata Roxb. var. *platistachya* G. Don, Gen. Syst. 4: 2 (1837 or 1838). — *S. polystachya* Wall. [Cat.: 4428 (1831), *nomen*] *ex* DC., Prod. 8: 254 (1844); Zoll., Syst. Verz.: 34 (1854); Miq., Fl. Ind. Bat. 1(2): 465 (1859). — *Lodhra polystachya* Miers, J. Linn. Soc. Bot. 17: 300 (1879). — *S. ferruginea* Roxb. var. *polystachya* Clarke, Fl. Br. Ind. 3: 575 (1882). — Type: *Wallich 4428* (BM photo!, CGE, K-W, LE, W!), Sylhet.

S. verhuellii Jungh. & De Vriese, Pl. Ind. Bat. Or. 3: 12 (1845); Miq., Fl. Ind. Bat. 1(2): 467 (1859). — *Lodhra verhuellii* Miers, J. Linn. Soc. Bot. 17: 302 (1879). — Type: *Junghuhn s. n.* (L, *non vidi*, isotype in A), Sumatra, Batak Lands.

S. horsfieldiana Miq., Fl. Ind. Bat. Suppl. 1: 475 (1861). — Type: *Horsfield 40* (CGE, K, *non vidi*), Banka.



Map 11. Distribution of *Symplocos cochinchinensis* (Lour.) Moore var. *cochinchinensis*. A small disk is based on the literature.

S. lachnobotrys Miq., Fl. Ind. Bat. Suppl. 1: 475 (1861). — *Eugeniodes lachnobotrys* O. K., Rev. Gen. Pl. 2: 975 (1891). — Type: *Diepenhorst s. n.* (*HB2876* BO!, isotype in K), W. Sumatra, Priaman.

S. lachnobotrys var. *glabrior* Miq., Fl. Ind. Bat. Suppl. 1: 475 (1861). — Type: *Teysmann s. n.* (*HB665* BO!, isotype in L), Sumatra, Padang, Pulau Pisang.

S. ferruginea Roxb. var. *philippinensis* Brand, Philip. J. Sc. Bot. 3: 6 (1908). — *S. cochinchinensis* var. *philippinensis* Nooteboom, Leid. Bot. Ser. 1: 154 (1975); in Li et al., Fl. Taiwan 4: 116 (1978). — Lectotype: *Ahern 440* (BO! see note below, US), Philippines, Dinagat. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 144 (1975)). Note. The specimen deposited in BO as lectotype is not *Ahern 440* but *Ahern 4409* (Plate 61d) collected in Mindanao.

S. kotoensis Hayata, Icon. Pl. Form. 5: 106, t. 31 (1915); Kanehira, Form. Woods: 151 (1921); Makino & Nemoto, Fl. Jap. ed. 2: 920 (1931); Mori, Sylvia 5(4): 235 (1934); Kanehira, Form. Tr. (ed. 1936): 593, t. 550 (1936); Walker, Imp. Tr. Ryukyu Is.: 263, t. 168 (1954); Ohwi, Fl. Jap.: 932 (1953); Fl. Jap. English ed.: 739 (1965); Li, Wood. Fl. Taiwan: 739 (1963). — *Bobua kotoensis* Yamamoto, Suppl. Ic. Pl. Form. 4: 19 (1928). — *Dicalix kotoensis* Hara, Enum. Sperm. Jap. 1: 104 (1948). — Type: *Kawakami & Sasaki s. n.* (TI!, Plate 62a), Kotosho (Lanyu Is.), Taiwan.

S. lithocarpoides Nakai, Bot. Mag. Tokyo 36: 136 (1921). — *Bobua lithocarpoides* Nakai, Tr. & Shr. ed. 1: 243, t. 136 (1922); Bot. Mag. Tokyo 38: 42 (1924); Tr. & Shr. ed. 2: 326, t. 153 (1927). — Lectotype: *T. Uchiyama s. n.* (TI!, Plate 61c), Higanakama, Amami-Oshima, 7 Dec. 1900. (selected by Nakai *in sched.*, published here).

S. ferruginifolia Kanehira, Trans. Nat. Hist. Soc. Form. 20: 383 (1930); Form. Tr. (ed. 1936): 585, t. 542 (1936). — Type: *Z. Fujiwara* (*non vidi*), Dec. 1929, Bunzan-gun, Taihoku Pref., 100 m.

S. ferruginea Roxb. var. *glabra* Fletcher, Kew Bull. 1937: 505 (1938). — Type: *Kerr 15397* (K, *non vidi*, isotypes in BM, E, SING!), Lam Saka, Thailand.

S. patens auct. *non* Presl: Liu, Lign. Pl. Taiwan: 1054 (1962); Kitamura & Murata, Wood. Pl. Jap. 1: 98, t. 117 (1971); Ohwi, Fl. Jap. rev. ed.: 1073 (1972); Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 560 (1975).

Distr. Japan (Kyushu, Ryukyu), Taiwan, China, Indochina, Thailand, ?Burma, India, Malay Peninsula, Sumatra, Java, Borneo, Philippines, New Guinea.

11-1. var. **cochinchinensis**

All synonyms except *S. ferruginea* var. *philippinensis* Brand and *S. kotoensis* Hayata

Evergreen trees; bark gray-brown, smooth. Twigs gray-brown, terete; young twigs thick, rusty tomentose to glabrescent; slightly ridged below petioles. Terminal buds narrowly ovoid, rusty tomentose, 7–12 mm long, apex acuminate, usually curved. *Leaves*: blades coriaceous, elliptic to narrowly elliptic, 14–25 cm long, 5–9 cm wide; apex caudate; base cuneate; margin slightly recurved, glandular dentate to crenulate with teeth 2–4 mm apart; upper surface glabrous; lower surface pale green, brownishly pubescent especially on midrib and nerves, sometimes glabrescent and the midrib appressed pilose, rarely rusty tomentose; midrib impressed on upper surface, prominent on lower surface; nerves 9–12(–14) pairs, distinctly prominent on lower surface, curved in parallel upwards; petioles brownish pubescent, tomentose or glabrescent, (7–)10–25(–30) mm long. *Inflorescence* an axillary spike, usually branched, 3–10(–12) cm long, axis brownish to rusty tomentose; bracts ovate 2.5–4 mm long, apex acute; bracteoles 2, ovate to depressed ovate 2.5–3 mm long, apex acute; both persistent, keeled, adaxially glabrous, abaxially with same indument as inflorescence axis. *Flowers*: calyx tube glabrous, 0.5–1 mm high; calyx limb 1.5–2(–2.5) mm long; calyx lobes imbricate, ovate, 1.5–2(–2.5) mm long, the apex obtuse, outside appressed pubescent, the margin ciliate; corolla white, 4.5–6 mm long, deeply 5-lobed, the lobes elliptic; corolla tube 1–1.5 mm long; stamens 60–80, indistinctly pentadelphous; disk glabrous, annular to cylindrical; style glabrous, 4–6 mm long; ovary 3-locular with 4 ovules in each locule. *Fruits* ampulliform or globose, often with a cylindrical neck, 6–7 mm long, 6–7 mm in diameter, persistent calyx lobes forming a conical beak; stones ampulliform, shallowly grooved, 5–6 mm by 5–6 mm; mesocarp thin; endocarp woody; seed 1, twice curved, with similarly curved embryo. *Pollen grains* 3-porate or 3-colporate, circular to semiangular in polar view, oblate in equatorial view; tectum spinulate; colpi indistinct and the outline of ektoaperture vague; ora circular; 18.4–19.9 μm (P) × 22.2–26.3 μm (E); pollen type IId. — Flowers: July–Aug. (in Japan). Fruits: ? May–? July (in Japan).

Jap. name: Aoba-no-ki

Habitat. Subtropical evergreen forests, often in secondary growth.

Distr. Japan (Kyushu, Ryukyu), Taiwan, China, Indochina, Thailand, ?Burma, India, Malay Peninsula, Sumatra, Java, Borneo, ?Philippines, New Guinea.

JAPAN. **Kyushu**. Kagoshima. Tanegashima Is.: Nakawari, *Z. Tashiro* (KYO). Yakushima Is.: *Faurie 3808* (KYO, W); Kurio, *M. Tagawa 1832* (KYO); Ambo, *M. Togashi 1436* (KYO); Miyanoura, *M. Tagawa 1831* (KYO); Nagata River, 100–200 m, *J. Murata et al. 15485* (KYO, TI); Kosugidani, *M. Togashi 374* (TI). **Ryukyu**. Kagoshima. Amami-Oshima Is.: Higanakama, *T. Uchiyama* (TI); Naze to Yamato *G. Koidzumi* (KYO); Naze, *Z. Tashiro* (KYO); Shidokan, Yamato-son, *S. Sako 5964* (KYO, TI); Yuwan–Ikegachi, *H. Ohba 95* (KYO); Mt. Yuwan, *T. Amano 6527* (RYU); Sumiyo-son, *T. Amano 6531* (RYU); Uken-son, *M. Furuse 8063* (RYU); 30 m, *S. Sako 4862* (TI). Tokunoshima Is.: Mikyo, *H. Migo* (KYO), *H. Ohba 263, 264* (KYO). Okinoerabu Is.: *Y. Miyagi 5767* (RYU), *S. Hatusima & Y. Miyagi 39090* (RYU). — Okinawa. Okinawa Is.: Kunigami, *Y. Niiro 510* (RYU); Oku, *S. Sonohara* (KYO); Sate, *G. Koidzumi* (KYO); Sosu, Kunigami, *Z. Tashiro* (KYO); Onna-dake, Onna, *T. Kanagusuku* (KYO); Misato-son, Nishibaru, *S. Tawada 231* (KYO); Kanekadan, Gushikawa, *Y. Miyagi 9488* (RYU). Kume Is.: *S. Hatusima 34237* (RYU), *Y. Niiro 758* (RYU). Kita-daito Is.: *T. Kanshiro 5754* (RYU), *Y. Miyagi & Y. Niiro 3083* (RYU), *T. Yamazaki 579* (KYO, TI); on pond, *S. Hatusima 33797* (RYU). Minami-daito Is.: *S. Gima 59* (KYO, RYU), *Y. Miyagi 8220* (RYU, TI); Hakubu-jinja, *A. Minami TNS348901* (TNS). Ishigaki Is.: *F.R. Fosberg 38060* (TI), *G. Koidzumi* (KYO); Maedake, Kabira, *M. Furuse 3683* (RYU); Banna-dake, *H. Nagamasu 1131* (KYO), 100 m, *T. Yamazaki* (TI); Mt. Omoto-dake, *S. Tamaki* (RYU); Urasoko, *E. Takamine 5654* (RYU); Hona, *E. Takamine 2376* (RYU). Iriomote Is.: *G. Koidzumi* (KYO), *E. Takamine 6896* (RYU); Yutsun-Omija, 30 m, *Y. Miyagi 9276* (KYO, RYU, TI); along a crosscut from Komi, *K. Iwatsuki 685* (KYO); Yutsun River, 5–260 m, *S. Mitsuta & H. Nagamasu 357* (KYO); a branch of Nakama River, *K. Iwatsuki et al. 697, 701* (KYO), *Y. Kimura & Furusawa* (TI); Kampira waterfall, 60–80 m, *G. Murata et al. 56449* (KYO); Urauchi River, *F. Yamazaki et al.* (TI), *S. Hatusima 18810* (TI); Mt. Komi, *S. Gima 243* (RYU). Yonaguni Is.: *G. Koidzumi* (KYO), *Hatusima et al. 35474* (RYU); Donan-dake, 40–100 m, *H. Nagamasu 1533* (KYO).

TAIWAN. Shinten, *K. Mori* (TI).

CHINA. Guangdong: Yam Na Shan, Mei Distr., *W.-T. Tsang 21377* (KYO); Sha Lo Shan, Wa Mei Tong Village, Sin-fung Distr., *Y.-W. Taam 179* (KYO, TI); Sha Lo Shan, Lo-Lo-Ha Village, Sin-fung Distr., *Y.-W. Taam 901* (KYO). — Guangxi: Yao Shan, *C. Wang 39353* (KYO). — Hainan: Chim Fung Mt., near Fong Ngau Po Village, Kan-en Distr., *S.-K. Lau 5562* (KYO); Bak Sa, *S.-K. Lau 26056* (KYO); Loktung, *S.-K. Lau 27421* (KYO); Nam Tung and vicinity, Lam Ko Distr., *C.-I. Lei 418* (KYO, TI); Pak Shik Ling and vicinity, Ku Tung Village, Ching Mai Distr., *C.-I. Lei 810* (KYO, TI); Yeung Lam Shan, near Yeung Lam Village, Yai Hsien Distr., *S.-K. Lau 6172* (KYO).

INDOCHINA. Tonkin: station expérimentale de Phu Tho, *M. A. Chevalier 41024* (KYO); Taai Wong Mo Shan, NE of Chuk-pai, Ha Coi, *W.-T. Tsang 29279* (TNS); Sai Won Mo Shan, Long Ngong Village, Dam Ha, *T.-S. Tsang 30461* (TNS).

THAILAND. Chiang Mai: Doi Chang, Maetaeng Distr., 1500 m, *H. Koyama et al. T-32788* (KYO). — Loei: Phu Kradung, 1150–1250 m, *G. Murata et al. T-42682* (KYO). — Pangnga: Khao Pawta Luang Keow, 900–1000 m, *R. Geesink et al.* (KYO).

INDIA. Nepal: Narainhetty, *Hamilton* (BM); between Kuti and Lamjung, 1000 m, *J. Fujimura 212* (KYO); Siwalik Hill, between Buditola and Bhasu, 1300 m, *H. Tabata et al. 563* (KYO). — Butan: Paro, *K. Nishimura* (KYO). — Assam: Garo Hills, *Roxburgh* (BM). — Sylhet: *Wallich 4412, 4428* (W).

MALAY PENINSULA. Perak: 200–300', *King's Coll. 7091* (W). — Penang: *Kook 807* (W); 150', *King's Coll. 1353* (W).

SUMATRA. Aceh: G. Leuser Nat. Res., upper Mamas River, 1300 m, *Wilde & Wilde-Dujfies 19034* (KYO). — West Sumatra: Arau Nature Res., Payakumbuh, 600 m, *M. Hotta & R. Tamin 305* (KYO); Air Sirah, near Padang, 1000–1100 m, *M. Hotta et al. 945* (KYO); Ulu Gadut, Padang, 350 m, *M. Hotta 25157* (KYO).

JAVA. Mt. Lawu, Tawang-manggu, *S. Yoshida 1826* (KYO); G. Gedeh, Tjibodas, *Arsin 19622* (W); Preanger, Tjadas malang bij Tjidadap, 1000m, *Winckel 1829b* (W).

BORNEO. Sarawak: *J. & M. Clemens 20392* (W).

NEW GUINEA. Wandammen Peninsula: Wondiwoi Mts., 600 m, *F.A.W. Schram BW 13460* (KYO). — Morobe Distr.: on road to Kauli Creek, Wau, 3700', *A.N. Miller NGF14576* (KYO).

Note. This species is also known from Nakanoshima Is., Tokara Isls. (Hatusima, 1986).

12. **Symplocos theophrastifolia** Sieb. & Zucc. — Fig. 3-12, Map 12, Plate 62b–d.

S. theophrastaefolia Sieb. & Zucc., Fam. Nat. 2: 134 (1846); Miq., Prol. Fl. Jap.: 266 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 508 (1875); Mori, Sylvia 5: 246 (1934); Sylvia 6: 29, t. 31 (1935); Kanehira, Form. Tr. rev. ed.: 601, t. 558 (1936); Li, J. Wash. Ac. Sc. 43: 109 (1953); Ohwi, Fl. Jap.: 932 (1953); Liu, Lign. Pl. Taiwan: 1057, t. 881 (1962); Li, Wood. Pl. Taiwan: 738 (1963); Ohwi, Fl. Jap. English ed.: 720 (1965); Kitamura & Murata, Wood. Pl. Jap. 1: 97, t. 116 (1971); Ying, Bull. Exp. For. NTU 116: 558 (1975); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, pl. 191-3, 4 & 5 (1989). — *Bobua theophrastaefolia* Miers, J. Linn. Soc. Bot. 17: 306 (1879); Nakai, Tr. & Shr. ed. 1: 241, t. 135 (1922); op. cit. ed. 2: 324, t. 152 (1927). — *Dicalix theophrastaefolius* Migo, Shangh. Sizenk. Kenk. Iho 13: 207 (1943); Hara, Enum. Sperm. Jap. 1: 107 (1948). — Type: *Siebold s. n.* (L! Plate 62b, isotype in MAK!), Japan.

S. stenostachys Hayata, Ic. Pl. Form. 5: 115 (1915); Kanehira, Form. Tr.: 361 (1917); Makino & Nemoto, Fl. Jap. ed. 2: 923 (1931). — Type: *Kawakami 1438* (TI!, Plate 62c), Goshizan, Shinchiku, Taiwan.

S. spicata auct. *non* Roxb.: Brand, Pfl. R. Heft 6: 39 (1901), *p. p.*; Matsumura & Hayata, J. Coll. Sc. Univ. Tokyo 22: 231 (1906); Matsumura, Ind. Pl. Jap. 2(2): 488 (1912).

S. spicata var. *acuminata* auct.: Brand, Pfl. R. Heft. 6: 40 (1901), Matsumura, Ind. Pl. Jap. 2(2): 488 (1912); Hayata, Icon. Pl. Form. 5: 115 (1915).

S. cochinchinensis subsp. *laurina* auct.: Nooteboom, Leid. Bot. Ser. 1: 156 (1975); in Li et al., Fl. Taiwan, 4: 118 (1978).

S. laurina auct.: Hatusima, Wood. Pl. Japan: 738 (1976); Wu, Fl. Reip. Pop. Sin. 60(2): 55 (1987).

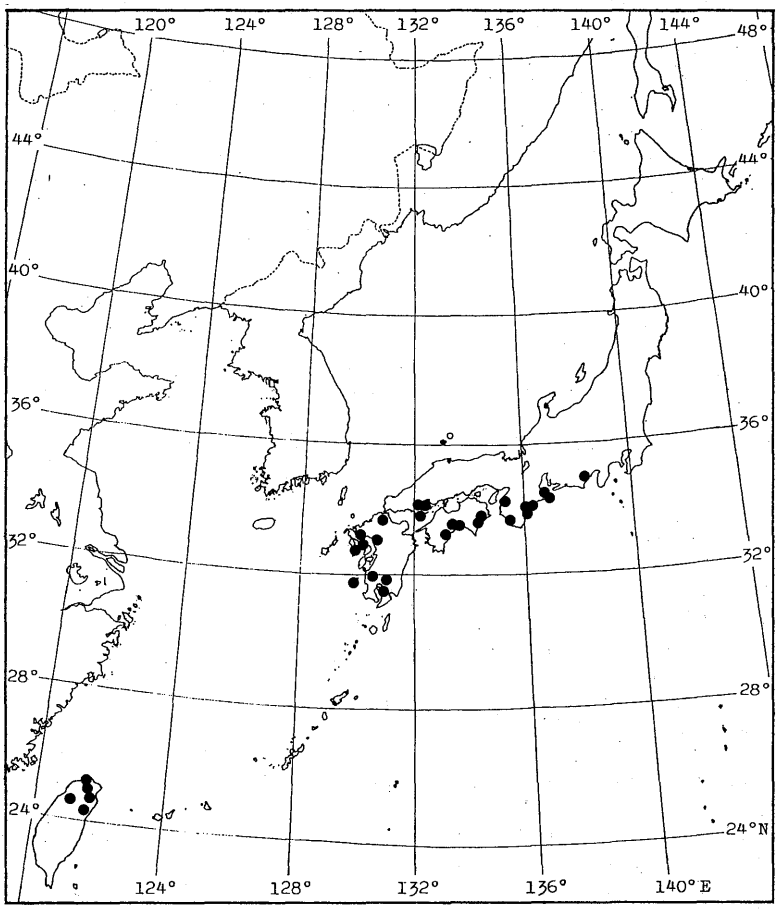
Evergreen trees; bark gray-brown, smooth. Twigs gray-brown, terete; young twigs brown with brown appressed hairs, soon glabrescent, slightly ridged below petioles. Terminal buds obliquely ovoid, tomentose to glabrescent, cinnamon-colored to rusty, apex acuminate, usually curved, 3–8 mm long. *Leaves*: blades coriaceous, narrowly elliptic to narrowly oblong, 7–15 cm long, 2–5 cm wide; apex caudate to acuminate; base cuneate to short attenuate; margin slightly recurved, crenate to serrate, with teeth 3–8 mm apart; upper surface glabrous; lower surface pale green to slightly glaucous, glabrous, sometimes sparsely appressed hairy on midrib; midrib impressed on upper surface, prominent on lower surface; nerves 8–12(–13) pairs, prominent on lower surface; petioles glabrous or sparsely appressed hairy, abaxially sulcate, 7–15 mm long. *Inflorescence* an axillary spike, often branched at base, (2.5–)3–5(–7) cm long, axis tomentose, cinnamon-colored; bracts ovate to transversely widely ovate, 1–1.5 mm long, apex obtuse to acute; bracteoles 2, ovate about 1 mm long; both persistent, keeled, adaxially glabrous, abaxially with same indument as inflorescence axis. *Flowers*: calyx tube glabrous, 0.5–0.8 mm high; calyx limb 0.5–1 mm long; calyx lobes imbricate, depressed ovate, 0.5–1 mm long, apex rounded to obtuse, outside sparsely appressed pubescent, margin ciliate; corolla white, 4–5 mm long, deeply 5-lobed, lobes elliptic to oblong; corolla tube about 1 mm long; stamens (40–)50–60, indistinctly pentadelphous; disk annular, glabrous; style glabrous, about 4 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* dark violet, globose to ampulliform, 5–6 mm long, 5–6(–7) mm in diameter, crowned by persistent calyx lobes; stones ampulliform, slightly grooved, 4–5 mm long, 4–5 mm in diameter; mesocarp thin; endocarp woody; seed 1, twice curved, with similary curved embryo. *Pollen grains* 3-porate or 3-colporate, circular to

semiangular in polar view, oblate to suboblate in equatorial view; tectum spinulate; colpi indistinct, outline of ektoaperture vague; ora circular; 18.4–19.3 μm (P) × 24.0–24.2 μm (E); pollen type IId. —Flowers: Aug.–Sept. Fruits: Oct.–Dec. (following year)

Jap. name: Kanzaburo-no-ki

Habitat. Warm-temperate evergreen forests.

Distr. Japan (Honshu, Shikoku, Kyushu), Taiwan, S China.



Map 12. Distribution of *Symplocos theophrastifolia* Sieb. & Zucc.

JAPAN. **Honshu**. Shizuoka: Okadeyama, Fujieda, *D. Shimizu* (KYO), *H. Shimizu 265* (TI); Fujieda, *J. Sugimoto* (TI). —Mie: Ise-jinja, Gegu, *Y. Yariga, K. Tsuchiya et al. 6* (KYO); Oniga, *T. Hattori 18* (KYO); Mt. Takakura, Gegu, *N. Fujita et al. 2* (KYO); Osawa-Isobe, Shima, *M. Honda* (TI); Kajiya-toge, Nansei-cho, *H. Hara & S. Kurosawa* (TI); Nunobiki, Mifune-mura, Minamimuro-gun, *T. Nakajima* (TI); Owase, Futatsukiya-dani, *T. Yamamoto 153* (KYO); Owase, Minami-dani, *G. Murata 10042, 10052* (KYO); Owase, *T. Hattori* (KYO); Funada, Mifune-mura, Minamimuro-gun, *T. Koide* (KYO). —Osaka: Sennan-cho, Kintai-ji, *S. Nakanishi 8750* (KYO). —Wakayama: Nishitonda-mura, Nishimuro-gun, *N. Ui* (KYO); Shinjo-mura, Nishimuro-gun, *T. Nakajima* (TI); Doro, *Z. Tashiro* (KYO). —Hiroshima: Miyajima, *K. Oka 44708, Z. Tashiro* (KYO). —Yamaguchi: Tononyu, Oshima, *Z. Tashiro* (KYO); Shiroyama, Iwakuni-shi, *S. Okamoto, K. Oka 3404, A. Minami 32661* (KYO). **Shi-**

koku. Tokushima: Tairyuji-san, *Z. Tashiro* (KYO); Shishikui-cho, 300 m, *T. Yamazaki* (TI). — Kochi: Godai-san, *H. Ito* (TI), *G. Koidzumi, M. Tagawa 851* (KYO); Sagawa-cho, *G. Koidzumi* (KYO); Honokawa, Takaoka-gun, *H. Ito* (TI). **Kyushu.** Fukuoka: Ueno-kyo, Akaike-cho, Tagawa-gun, *N. Kumagai 15-B.* — Saga: Kurokami-san, Arita-cho, 120–518 m, *H. Nagamasu 1881, 1883, 1897* (KYO). — Nagasaki: Sakaegawa valley, *F.C. Greatrex 52/33* (TI); Mt. Tara-dake, *Z. Tashiro* (KYO). — Kumamoto: Shodai-san, *T. Sugino* (KYO). — Miyazaki: Tano–Miyakonojo, *Z. Tashiro* (KYO). — Kagoshima: Mt. Takakuma, Tarumizu-shi, *H. Takahashi 4189* (KYO); Manedaira, Oguchi, *H. Muramatsu* (TI); Koshiki-jima, *Z. Tashiro* (KYO), *S. Sako 1514* (KYO).

TAIWAN. Taipei: Agyoku, Bunzan-gun, *M. Tagawa 207* (KYO, TI); inter Urai et Tanpiya, *M. Tagawa 304* (KYO, TI); Urai, *T. Soma* (TI); Kusshaku, *T. Nagasawa 665* (KYO); prope Hokuto, *M. Tagawa 667* (TI); near Toulinli zoo, *C.M. Kuo 12092* (TI); Sozan, *M. Honda & H. Ito* (TI); Mt. Tatung, *M.T. Kuo 6299* (TI); Shinko, *S. Nagasawa 233* (TI), *T. Kawakami & U. Mori 1330* (TI). — Hsinchu: Goshizan, *T. Kawakami 1438* (TI). — Ilan: Mt. Bonbon, *M.T. Kao 5996* (TI). — Hwalien: Tabirakei, *Anonymous* (TI).

CHINA. Guangdong: Sha Lo Shan, Wa Mei T'ong Village, Sing-fung Distr., *Y.-W. Taam 220* (KYO, TI); Hau T'ong Shan, Fuk Lung Monastery, Sin-fung Distr., *Y.-W. Taam 878* (KYO, TI); White Cloud Mt., *C.O. Levine 2057* (TI).

Sect. 4. **Lancifoliae** Nagamasu

Key to the species

1a. Bracts 1–2 mm long; disk usually glabrous; fruits 4–6 mm long; flowering in autumn. ..... 13. *S. lancifolia*

1b. Bracts 0.7–1 mm long; disk pilose; fruits 3–4 mm long; flowering in spring. ..... 14. *S. microcalyx*

13. **Symplocos lancifolia** Sieb. & Zucc. — Fig. 3-13 & 4h, Map 13, Plate 62b–d & 63a–d.

S. lancifolia Sieb. & Zucc., Fam. Nat. 2: 133 (1846); Miq., Prol. Fl. Jap.: 265 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 307 (1875); Brand, Pfl. R. Heft 6: 41 (1901); Matsumura, Ind. Pl. Jap. 2(2): 487 (1912); Gontscharow, Not. Syst. Herb. Ross. 5: 103 (1924); Rehder, J. Arn. Arb. 15: 299 (1934); Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 36 (1943); Ohwi, Fl. Jap.: 932 (1953); *op. cit.* English ed.: 726 (1965); Kitamura & Murata, Wood. Pl. Jap. 2: 97, t. 115 (1971); Nooteboom, Leid. Bot. Ser. 1: 214 (1975), *p. min. p.*; Wu, Fl. Reip. Pop. Sin. 60(2): 52 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 173, pl. 191-1, 2 (1989). — *Bobua lancifolia* Miers, J. Linn. Soc. Bot. 17: 306 (1879); Nakai, Tr & Shr. ed. 1: 238, t. 239 (1922); *op. cit.* ed. 2: 320, t. 150 (1927). — *Dicalix lancifolius* Hara, Enum. Sperm. Jap. 1: 105 (1948); Migo, Yamaguchi J. Sc. Yamaguchi Univ. 7: 1 (1956). — Type: *von Siebold s. n.* (L!, Plate 62d), Japan. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 214 (1975)).

S. leptostachys Sieb. & Zucc., Fam. Nat. 2: 134 (1846). — *S. lancifolia* var. *leptostachys* Miq., Prol. Fl. Jap.: 265 (1867). — *Bobua leptostachys* Miers, J. Linn. Soc. Bot. 17: 306 (1879). — Type: *von Siebold s. n.* (L!, Plate 63a), Japan. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 214 (1975)).

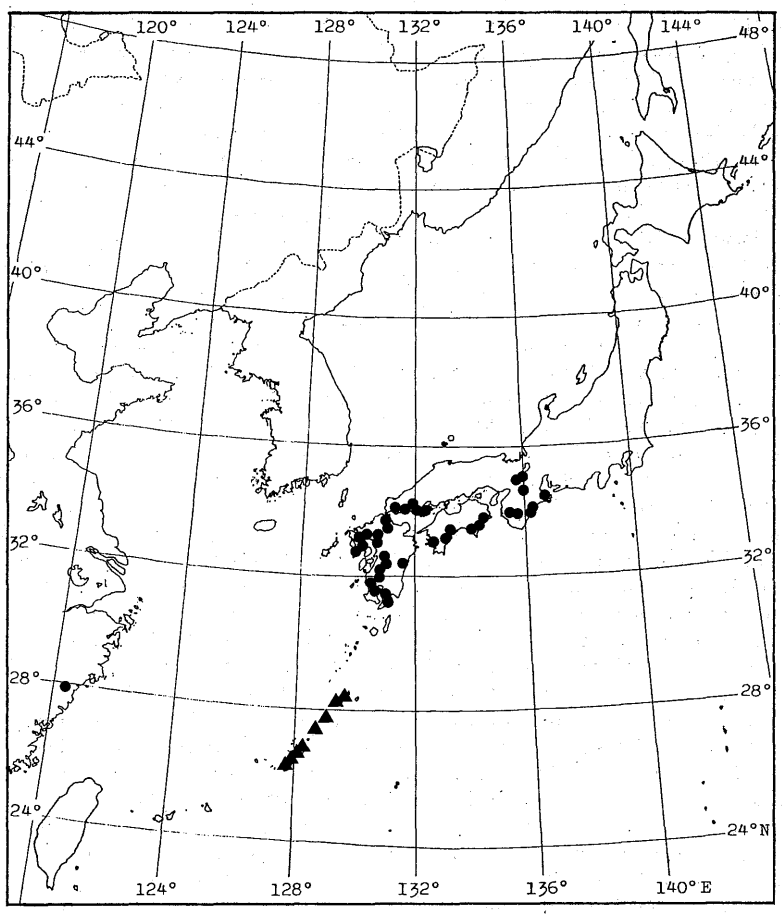
S. microcarpa Champ. *ex* Benth., Hook. J. Bot. 4: 303 (1852); Fl. Hongkong: 212 (1861). — *Lodhra microcarpa* Miers, J. Linn. Soc. Bot. 17: 302 (1879). — *S. lancifolia* var. *microcarpa* Hand.-Mazz., Beih. Bot. Centralbl. 62-B: 37 (1943). — Type: *Champion s. n.* (A!, K! Plate 63b), Hongkong.

S. lancifolia var. *cryptostachya* Miq., Prol. Fl. Jap.: 265 (1867). — Type: *Textor* (L!, Plate 63c), Japan. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 214 (1975)).

S. lancifolia var. *fulvipes* Clarke, Fl. Br. Ind. 3: 578 (1882). — *S. fulvipes* Brand, Pfl. R. Heft 6: 41 (1901). — Type: *Hook. f. & Thomson 50* (K! Plate 63d, isotypes in A!, BM!, E!, FI, L!, MEL, NY, W!), Mont. Khasia, India. (Lectotypification: Nooteboom, Leid. Bot. Ser. 1: 214 (1975)).

Small evergreen trees; bark brownish gray, smooth. Twigs dark brown, terete; young

twigs brown, villose and pilose, terete. Terminal buds ovoid, with several scales, appressed hairy, apex acute. *Leaves*: blades thinly coriaceous, narrowly ovate to lanceolate, 3–8(–10) cm long, 1.5–2.5(–4) cm wide; apex acuminate to caudate with apiculate tip; base cuneate to rounded; margin serrate to crenate, with teeth 1.5–4 mm apart; upper surface glabrous except the pilose midrib; lower surface appressed hairy when young, soon glabrescent except for pilose midrib, more or less glossy; midrib slightly prominent or sulcate on upper surface, prominent on lower surface; nerves 3–10 pairs, slightly prominent on lower surface; petioles villose and/or (sparsely) pilose, 1–3(–4) mm long. *Inflorescence* an axillary simple spike or a short pedicelled raceme, 7 to 20-flowered, 0.5–3 cm long, the axis pilose and villose; pedicels up to 1 mm long; bracts 2, ovate to widely ovate, keeled, 1–2 mm long, apex acute; bracteoles 2, widely ovate, keeled, 1–1.5 mm long; both persistent, inside glabrous, outside appressed hairy. *Flowers*: calyx tube glabrous to sparsely hairy, 0.5–1 mm high; calyx lobes imbricate, ovate, about 1 mm long, outside appressed hairy or rarely glabrescent;



Map 13. Distribution of *Symplocos lancifolia* Sieb. & Zucc. (disk) and *S. microcalyx* Hayata (triangle).

corolla white, deeply 5-lobed, 2.5–3 mm long, the lobes elliptic; stamens 15–25, connate at base; disk 5-glandular, glabrous or rarely minutely pilose; style glabrous 2.5–3(–4) mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* black, widely obovoid to globose, 4–6 mm by 4–5 mm, the persistent calyx lobes forming a blunt beak; stones (broadly) obovoid, smooth to slightly grooved, 4–5 mm by 3–4 mm; mesocarp thin; endocarp woody; seed 1, curved, with curved embryo. *Pollen grains* 3(–4)-porate or 3(–4)-colporate, circular to semiangular in polar view, suboblate in equatorial view; tectum densely corrugate; colpi indistinct, outline of ektoaperture irregular; ora circular; 18.3–18.6 μm (P) × 22.0–22.4 μm (E); pollen type IIc. —Flowers: Sept.–Oct. Fruits: Oct.–Dec. (following year).

Jap. name: Shirobai

Habitat. Warm temperate evergreen forests.

Distribution. Japan (Honshu, Shikoku, Kyushu), S China, NE India.

JAPAN. **Honshu**. Mie: Gekuu shrine, Ise, 20 m, *H. Kanai 6881* (TI); Minami-dani, Owase, *G. Murata 10051* (KYO); Kowa-dani, Owase, *J. Sugimoto TNS163821* (TNS). —Shiga: Miidera-yama, *C. Hashimoto 2301* (KYO), *8354* (TI, TNS). —Kyoto: Higashiyama, Kyoto, *G. Koidzumi* (KYO), *G. Muratra 636* (KYO, TI, TNS); Kiyomizuyama, Kyoto, *Z. Tashiro* (KYO); Yoshidayama, Kyoto, *S. Kitamura* (KYO); Matsuo-jinja, Ukyo, *G. Nakai 5390* (KYO); Kamigamo, Kyoto, *Y. Araki 14127* (KYO), *H. Nagamasu 1898* (KYO); Yamashina, Kyoto, *K. Takeuchi* (KYO). —Nara: Kasuga-yama, Nara-shi, 300–400 m, *S. Fujii 2025* (KYO). —Wakayama: Oto-san, *S. Sakaguchi 9* (KYO); Shingu, *T. Makino 129077* (KYO); Nachi-san, Higashimuro-gun, *T. Nakajima* (TI); Kozuke, Nachikatsuura, *K. Oohara* (KYO); Hirai, Nanakawa-mura, Nishimuro-gun, *T. Nakajima* (KYO); Hidaka-gun, *S. Sakaguchi 8* (KYO). —Hiroshima: Itsukushima Is., *Y. Miyagi 1856* (RYU). —Yamaguchi: Hosenji, Yamaguchi-shi, *K. Oka 3652* (TI), *3653* (KYO); Sako, Kawakami, Tokuyama-shi, *H. Masaki 12917* (KYO); Ogori-cho, *A. Minami 36258* (KYO); Kameyama, Yamaguchi-shi, *H. Migo* (KYO); Izumo-jinja, Tokuji-cho, Saba-gun, *A. Minami 35596* (KYO); Nishiatsuho-cho, Mine-shi, *K. Oka 36545* (RYU). **Shikoku**. Tokushima: Dairyuji-san, *Z. Tashiro* (KYO); Kainose, Kainan-cho, *H. Koyama 1158* (KYO, TNS); Kawanishi, Kaifu-gun, *T. Inobe 261* (TI); Shishikui-mura, Kaifu-gun, *J. Nishina 1652* (TI, TNS). —Kagawa: Onigajo-yama, *Anonymous* (TI). —Ehime: Hakogatani, Kiyomitsu-mura, Kitauwa-gun, *M. Ogata 17* (KYO), *Z. Tashiro TNS39248* (TNS); Nametoko-yama, *M. Ogata* (KYO). —Kochi: Nakanokawa, Nakayama-mura, Aki-gun, *M. Tagawa* (KYO); Izuta, Hata-gun, *K. W.* (TI); Chosoji, Takaoka-gun, *Makino* (TI). **Kyushu**. Fukuoka: Mt. Kora, *T. Osada TNS106127* (TNS); Akaike-cho, Tagawa-gun, *S. Tsugaru 508* (KYO); Ehiko-mura, Tagawa-gun, *S. Tokunaga* (TNS). —Saga: Mt. Kurokami, 120–518 m, *H. Nagamasu 1884, 1890* (KYO); Saga-gun, *Anonymous* (KYO). —Nagasaki: Nagasaki, *Maximowiczi* (TNS); Mt. Taradake, *F.C. Greatrex 180/38* (TI); Ikeda, Omura, 280 m, *H. Taoda 3614* (KYO); Kigitsu, Nishisonogi-gun, *Anonymous* (KYO); Shiroyama, Isahaya, *Z. Tashiro* (KYO), *H. Hara* (TI). —Kumamoto: *Anonymous* (KYO); Aida, *K. Maebara 570* (KYO); Shotai-san, *Z. Tashiro* (KYO), *H. Kamizuma* (KYO); Koura, Toyo-cho, Yatsushiro-gun, *Y. Shimada 8130* (KYO, TNS); Takada-mura, Yatsushiro-gun, *T. Nakajima* (TI); Koonose, *K. Maebara 569* (KYO), *3564* (TI); Hitoyoshi, *K. Maebara 3566* (TI); Mt. Noke'eboshi, *Z. Tashiro TNS 25008* (TNS). —Miyazaki: Yatogi-no-taki, Tsuno-cho, Koyu-gun, 400 m, *H. Takahashi 4123* (KYO); Todoroki to Yatogi-no-taki, 200–400 m, *H. Takahashi 6732* (KYO); Aoi-dake, *Z. Tashiro* (KYO); Mt. Osuzu-yama, 400–500 m, *N. Fukuoka 7172* (KYO), *H. Takahashi 1351* (KYO). —Kagoshima: Kurino-dake, *S. Muramatsu 37* (KYO); Takakuma-keikoku, 200–300 m, *S. Mitsuta et al. 50* (KYO); Hiwaki, Satsuma-gun, *S. Hatusima & S. Sako 27240* (KAG, KYO, TI); Shibi-san, *Z. Tashiro* (KYO, TI); Gamou-mura, Aira-gun, *Z. Tashiro* (KYO); Mt. Hoyoshi-dake, *Y. Momiyama* (TI); Izaku-toge, Taniyama-city, *S. Hatusima 16986* (RYU, TNS).

CHINA. Zhejiang: *R.-C. Ching 1743* (TI); between Ping Yung and Tai Suan, 500–900 m, *R.C. Ching 2188* (W). —Fujian: Ingkok, *H.-H. Chung 2663* (W). —Guangdong. Tapu District: Tai Mo Shan, *W.-T. Tsang 21038* (KYO); Tung Koo Shan, *W.-T. Tsang 21564* (KYO). Mei [Kaying] District: Yam Na Shan, *W.-T. Tsang 21375* (KYO). Sin-fung District: Ngong T'in Lo Shan, *Y.-W. Taam 310* (KYO); Ngok Shing Shan, *Y.-W. Taam 529* (KYO); Ah P'o Kai Shan, *Y.-W. Taam 646* (KYO); Hau T'ong Shan, *Y.-W. Taam 836* (KYO). Ho-yuen District: Kwai Shan, Tsing-lo-kong Village, *W.-T. Tsang 28681* (KYO); Nam Shan, Ts'ung-shue Village, *W.-T. Tsang 28851* (KYO). Lung-men District: Sam

Kok Shan, *W.-T. Tsang 20577* (KYO); Naam Kwan Shan, Sheung P'ing Village, *W.-T. Tsang 25267* (KYO). — Hong Kong: Kowloon Shan, *Y.-W. Taam 1998* (KYO); Ta-mau-shan, 300–700 m, *M. Togashi & G. Murata 8072* (KYO). — Guangxi: *C. Wang 39180* (KYO); Kulung, 1400 m, *Chun 91362* (W); Seh-feng Dar Shan, S Nanning, 2550', *R. C. Ching 8050* (W, with paniculate inflorescences). — Hainan: *S.-K. Lau 25927* (KYO, W).

INDIA. Khasia, *Hook. f. & Thomson 50* (A, BM, E, K, L, W); East Bengal, *Griffith 3648* (W).

Note. The pollen wall of this species is very thin, in contrast with the thicker pollen wall of *S. microcalyx* Hayata.

14. **Symplocos microcalyx** Hayata — Fig. 3-14, Map 13, Plate 64a.

S. microcalyx Hayata, Ic. Pl. Form. 5: 108, t. 32 (1915); Hatusima, Fl. Ryukyus: 476 (1971); Walker, Fl. Okinawa South Ryukyu Is. 834, t. 169 (1976); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 174, pl. 193-2 (1989); Shimabuku, Check List Ryukyu Is.: 353 (1990). — *Bobua microcalyx* Sasaki, Cat. Gavt. Herb.: 408 (1930). — *Dicalix microcalyx* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *G. Nakahara s. n.* (TI!, Plate 64a), Nago-dake, Okinawa Is., Ryukyu Isls., Japan.

S. okinawensis auct. *non* Matsumura: Walker, Imp. Tr. Ryukyu Is.: 265, t. 170 (1954).

S. lancifolia auct. *non* Sieb. & Zucc.: Nooteboom, Leid. Bot. Ser. 1: 214 (1975), *p. min. p.*

Evergreen shrubs or small trees; bark dark brown, smooth. Twigs dark brown, terete; young twigs grayish brown to ferrugineous, short pilose or villose. Terminal buds ovoid, with a few scales, appressed hairy, the apex acuminate and slightly curved. *Leaves*: blades coriaceous, elliptic, ovate or lanceolate, 2–6 cm long, (0.7–)1–2 cm wide; apex acute, acuminate or caudate with apiculate tip; base cuneate to short attenuate; margin more or less recurved, crenate to glandular dentate with teeth 2–5(–6)mm apart; upper surface shining, glabrous except the pilose midrib; lower surface dull, sparsely appressed hairy; midrib slightly prominent or sulcate on upper surface, prominent beneath; nerves (4–)5–7 pairs, slightly prominent beneath; petioles appressedly hairy, (1–)2–3(–4) mm long. *Inflorescence* axillary, a simple spike or a short pedicelled raceme, (5–)10–20(–28)-flowered, 1–3(–4.5) cm long, the axis grayish brown, villose; pedicels up to 1 mm long; bracts ovate to widely ovate, keeled, 0.7–1 mm long, apex acute or obtuse; bracteoles 2, ovate to widely ovate, 0.7–1 mm long; both persistent, adaxially glabrous, abaxially appressed hairy. *Flowers*: calyx tube glabrous or rarely sparsely appressed hairy, 0.5–1 mm high; calyx limbs ca. 1 mm long; calyx lobes imbricate, orbicular to widely ovate, apex obtuse, 0.5–1 mm long, outside glabrous or sparsely appressed hairy; corolla deeply 5-lobed, white, often tinged red-violet at apex of lobes, 3.5–4 mm long, lobes elliptic; stamens 18–30, pentadelphous; disk 5-glandular, pilose; style glabrous, 2.5–3.5(–4) mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* black, ovoid, 3–4 mm by ca. 3 mm, persistent calyx lobes forming a blunt beak; stones ovoid, smooth, 3 mm by 2.5 mm; mesocarp and endcarp thin, seed 1, curved with curved embryo. *Pollen grains* 3-colporate, semiangular in polar view, oblate to suboblate in equatorial view; tectum finely verrucate and partly corrugate; colpi short; ora transeversely elliptic; 18.8–19.1 μm (P) × 24.8–25.0 μm (E); pollen type IIb. — Flowers: Mar. – Apr. Fruits: Sept. – Oct.

Jap. name: Ama-shiba

Habitat. Subtropical evergreen forests, often along streamlets.

Distr. Japan (Ryukyu), endemic.

JAPAN. **Ryukyu**. Kagoshima. Amami-oshima Is.: *Z. Tashiro* (KYO), *G. Koidzumi* (KYO); Yamato-son, 250 m, *S. Sako 5342* (KYO, RYU); between Uken-son and Sumiyo-son, 250–400 m, *G. Murata 56325* (KYO); Kawachi River, Uken-son, *H. Ohba 35* (KYO), *M. Furuse 8198* (RYU); Kaneku–Ofuji, *G. Koidzumi* (KYO); Nase–Gusku, *H. Ohba* (KYO); Naze, *J.R. Ferrie 36* (KYO), *U. Faurie 3817* (KYO); Sumiyo-gawa, 10–150 m, *S. Mitsuta & H. Nagamasu 1099* (KYO); Shinson, Sumiyo-son, *M. Furuse 7900* (RYU); Sumiyo-son, *T. Shimizu 85-367* (KYO); Mt. Yuwan, 470–694 m, *H. Nagamasu 1127* (KYO); Mt. Takabachi, Sumiyo-son, 360–400 m, *S. Mitsuta & H. Nagamasu 1040, 1072* (KYO). Tokunoshima Is.: Kamezu-Isen, *H. Ohba 222* (KYO); Mt. Inokawa-dake, 100–550 m, *K. Iwatsuki 257* (KYO), *H. Nagamasu 1725, 1749* (KYO), *H. Nagamasu & M. Tamura 2111* (KYO), *G. Murata 56260* (KYO), *Y. Miyagi & S. Hatusima 39557* (RYU); Mt. Intabu-dake, Isen-cho, *Y. Miyagi & S. Hatusima 40218* (RYU). Okinoerabu Is.: *S. Hatusima & Y. Miyagi 39292* (RYU); China, *H. Ohba 58* (KYO); Oyama, *G. Ikeda* (RYU), *S. Hatusima & S. Sako 21527* (TI). — Okinawa. Okinawa Is.: Mt. Iyu-dake, *Y. Miyagi 3520* (RYU); Yona Exp. Forest of the Univ. Ryukyus, *M. Furuse 1757, 5104* (RYU), *S. Hatusima 33493* (RYU); Aha, 50–100 m, *S. Tawada 396* (KYO), *H. Nagamasu 2024, 2025* (KYO); Tanagagumui, *T. Amano 10472* (KYO, TI), *G. Murata et al. 56623* (KYO), *S. Mitsuta & H. Nagamasu 871* (KYO); Fuku-gawa, middle stream, *M. Furuse 4962* (RYU); Genka, *S. Sakaguchi* (KYO); Sade, *G. Koidzumi* (KYO), *S. Sonohara* (KYO); Mt. Yonaha-dake, 400–500 m, *N. Kurosaki 3858* (KYO), *S. Mitsuta & H. Nagamasu 718* (KYO), *K. Iwatsuki et al. 26* (KYO); Hentona-san, *S. Tawada 278* (KYO); Kuru-san, *S. Tawada 277* (KYO); Kunchan, *S. Sakaguchi* (KYO); Tanyu-dake, *Y. Taira 383* (TNS), *S. Sonohara et al. 6303* (TI); Nago-dake, *G. Nakahara* (TI); Onna-dake, *G. Koidzumi* (KYO), *T. Amano 6203* (RYU), *6204* (TNS); Naha, *G. Koidzumi* (KYO).

Notes. 1. Plants growing along streamlets often have narrower leaves as in rheophytes.

2. This species seems to be closely related to *S. taiheizanensis* of Taiwan and *S. aurea* and its allies of S China. The relationships between these taxa need further studies.

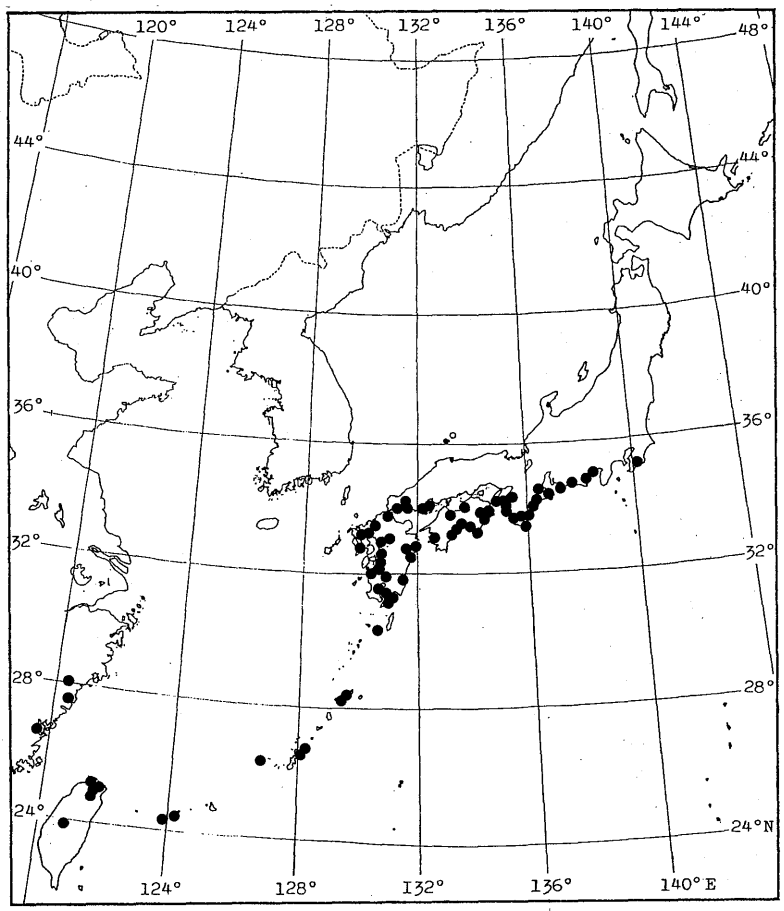
Sect. 5. **Glaucae** Nagamasu

15. **Symplocos glauca** (Thunb.) Koidz. — Fig. 3-15 & 4f, Map 14, Plate 64b.

S. glauca (Thunb.) Koidz., Bot. Mag. Tokyo 39: 313 (1925); Makino & Nemoto, Fl. Jap. ed. 2: 919 (1931); Mori, Sylvia 6: 20 (1936); Kanehira, Form. Tr. rev. ed.: 587, t. 544 (1936); Hand.-Mazz., Beih. Bot. Centralbl. 62B: 31 (1943); Li, Taiwania 1: 313 (1950); Walker, Imp. Tr. Ryukyu Is.: 262, t. 168 (1954); Ohwi, Fl. Jap.: 932 (1953); Liu, Lign. Pl. Taiwan: 1047, t. 871 (1962); Li, Wood. Fl. Taiwan: 745, t. 300 (1963); Hatusima, Fl. Ryukyus: 478 (1971); Kitamura & Murata, Wood. Pl. Jap. 1: 98, t. 118 (1971); Nooteboom, Leid. Bot. Ser. 1: 196 (1975); Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 552 (1975); Walker, Fl. Okinawa South. Ryukyu Is.: 831, t. 166 (1976), *quoad* var. *glauca*; Nooteboom in Li et al., Fl. Taiwan 4: 119, t. 936 (1978); Wu, Fl. Reip. Pop. Sin. 60(2): 30 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 190-1, 2 & 3 (1989); Shimabuku, Check List Ryukyu Is.: 352 (1990). — *Laurus glauca* Thunb., Nov. Acta Reg. Soc. Sc. Ups. 4: 37 (1783); Murray, Syst. Veg. ed. 14: 383 (1784); Thunb., Fl. Jap.: 173 (1784). — *Litsea glauca* Sieb., Verh. Bat. Gen. K. & W. 12: 24 (1830), *quoad nom.* — *Myrsine thunbergii* Tanaka, Bult. Sc. Fak. Terkult. Kjusu Imp. Univ. 1: 208 (1925); Momor. Pap. 150 Anniv. Thunb. Journ.: 34 (1925), *non vidi*. — *Bobua glauca* Nakai, Tr. & Shr. ed. 2: 322, t. 151 (1927); Bot. Mag. Tokyo 41: 521 (1927); Masamune, Fl. Geobot. Yakus. (= Mem. Fac. Sc. Agr. Taihoku Imp. Univ. 11): 364 (1934). — *Dicalix glaucus* Migo, Shangh. Sizenk. Kenk. Iho 14: 335 (1944); Hara, Enum. Sperm. Jap. 1: 104 (1948). — Type: *Thunberg* (UPS, microfiche!), Japan.

S. neriifolia Sieb. & Zucc., Fam. Nat.: 134 (1846); Franch. & Sav., Enum. Pl. Jap. 1: 308 (1875); Brand, Pfl. R. Heft 6: 69 (1901); Matsumura, Ind. Pl. Jap. 2(2): 488 (1912); Kanehira, Form. Tr.: 358 (1917); Guillaumin, Bull. Soc. Bot. Fr. 71: 282 (1924); Fl. Gen. I.-C. 3: 1011, t. 115, f. 5 & 6 (1933); Mori, Sylvia 5: 229 (1934). — *Bobua neriifolia* Miers, J. Linn. Soc. Bot. 17: 306 (1879); Nakai, Tr. & Shr. ed. 1: 239, t. 134 (1922). — *Eugeniodes neriifolium* O. Kuntze, Rev.

Gen. Pl. 2: 975 (1891). — Type: *Siebold s. n.* (L!, Plate 64b), Japan.



Map 14. Distribution of *Symplocos glauca* (Thunb.) Koidz.

Small evergreen trees; bark brown, smooth. Twigs brown, terete, the pith often lamellated; young twigs thick, red-brown, glabrous or rusty tomentose, ridged below petioles. Terminal buds ovoid to narrowly ovoid, glabrescent to rusty tomentose, apex acuminate, 3–8 mm long. *Leaves*: blades coriaceous, narrowly oblong, narrowly elliptic or narrowly obovate, 8–15(–18) cm long, (1.5–)2–4 cm wide; apex acuminate, caudate or sometimes acute; base cuneate; margin recurved, entire or often distally with glandular teeth; both surfaces glabrous or sparsely cobwebby hairy, especially on midrib; lower surface densely papillose; midrib impressed on upper surface, very prominent on lower surface; nerves 8–13 pairs, prominent on both surfaces, rarely impressed on upper surface; petioles glabrescent to rusty tomentose, lengthwise deeply grooved when dry, 8–20 mm long. *Inflorescence* a contracted spike, from axils of leaves and/or on twigs, up to 1 cm long, the axis rusty tomentose; bracts orbicular, widely ovate or widely obovate, 2–3 mm long, apex rounded; bracteoles 2, ovate to oblong, 1.5–2 mm long, apex obtuse to rounded; both persistent, adaxially glabrous, ab-

axially rusty tomentose. *Flowers*: calyx tube glabrous, 0.5–0.8 mm high; calyx limb 1.5–2 mm long; calyx lobes, elliptic to oblong, 1–1.5 mm long, apex rounded to obtuse, outside tomentose; corolla white, 4–5.5 mm long, deeply 5-lobed, lobes elliptic; corolla tube about 1 mm long; stamens indistinctly pentadelphous, 35–55; disk annular, short cylindric or pulvinate, glabrous; style glabrous, 4–5.5 mm long; ovary 3-locular with 4 ovules in each locule. *Fruits* bluish black, (obliquely) ovoid, 12–19 mm by 6–8 mm; calyx lobes caducous or partly persistent; stones (obliquely) ovoid, shallowly grooved lengthwise or rather smooth, 10–17 mm by 5–7 mm; mesocarp thin; endocarp woody; seeds 1, straight with straight embryo. *Pollen grains* 3-porate or 3-colporate, semiangular in polar view, oblate in equatorial view; tectum corrugate and partly verrucate; colpi indistinct and the outline of ektoaperture irregular; ora circular; 18.8–20.2 μm (P) × 25.0–26.5 μm (E); pollen type IIc. — Flowers: July–Aug. (in Japan). Fruits: Aug.–Sept. (following year; in Japan).

Jap. name: Mimizu-bai

Habitat. Subtropical to warm-temperate evergreen forests.

Distr. Japan (Honshu, Shikoku, Kyushu, Ryukyu), Taiwan, S China, ?Indochina.

JAPAN. **Honshu**. Chiba: Mt. Kiyosumi, *T. Nakai* (TI). — Shizuoka: Mt. Kuno-zan, *M. Honda* (TI), *H. Kanai 4096* (TI); Fujieda, *J. Sugimoto* (KYO); Noman-ji, Yoshida-cho, *T. Ohmura 18625* (TNS); Mikkabi, *Shimozono* (TI); Hamamatsu, *H. Muramatsu* (TI). — Aichi: Noda-mura, *K. Torii 8905* (KYO); Senpukuji-yama, Atsumi Peninsula, *S. Okuyama 7596* (TNS). — Mie: Gegu, Ise, *Y. Yariga 384* (KYO), *N. Fujita et al. 3* (KYO), *H. Nagamasu 1964* (KYO); Shiroyama, Hisai-cho, *Z. Tashiro* (KYO); Arima-cho, Kumano-shi, *T. Koide 479* (KYO); Nako, Kuki, Owase-shi, 30 m, *S. Ishizawa 16360, 16606* (KYO); Shimakatsuura, Miyama-cho, 60 m, *N. Fukuoka 8773* (KYO); Jizodani, Kirihara, Kiho-cho, Minamimuro-gun, 100–300 m, *E. Kinoshita 1096* (KYO); Sugari-mura, Kitamuro-gun, *G. Nakai 4304* (KYO); Dorohatcho, *G. Nakai 5484* (KYO, TNS). — Osaka: Inaba, Izumi, *S. Matsuda TNS32086* (TNS); Misaki-cho, Sennan-gun, *S. Nakanishi 3650* (KYO). — Hyogo. Awaji-shima Is.: Mt. Mikumayama, Sumoto, *G. Koidzumi* (KYO), *N. Kurosaki et al. 2632, 2642* (KYO); Shiroyama, Sumoto-shi, *Z. Tashiro* (KYO); Chigusa, Sumoto-shi, *S. Hosomi 10032* (KYO). — Wakayama: Ogura, Wakayama-shi, *N. Kurosaki 12320* (KYO); Kankiji, Ishigaki-mura, Arida-gun, *S. Tanaka* (KYO); Ina, Hidaka-gun, *G. Murata 55654* (KYO); Hachiman-yama, Gobo-shi, *S. Kitamura & G. Murata 2301* (KYO); Kiitanabe, *N. Ui* (KYO), *T. Nakajima* (KYO, TI); Yunomine, *S. Yamaguchi* (KYO). Oshima Is., *S. Kitamura* (KYO), *M. Hiroe 13264* (KYO). — Hiroshima: Miyajima Is., *H. Taoda 3509* (KYO), *S. Miyake RYU46259* (RYU), 10–30 m, *H. Akiyama 8928* (KYO). — Yamaguchi: Shiroyama, Iwakuni-shi, *S. Okamoto* (KYO); Ushinoya-cho, Iwakuni-shi, *K. Oka 42755* (KYO); Hofu, *K. Oka 38233* (KYO, RYU); Kagawa, Yamaguchi-shi, *K. Oka 37376* (KYO); Kuroiwahachimangu, Ube-shi, *K. Oka 38338* (KYO); Hikari-shi, *M. Togashi 670* (KYO, TI, TNS, W), *H. Migo* (KYO). **Shikoku**. Tokushima: Mugi-sho, Kaifu-gun, *S. Takafuji 501* (KYO); Myodo-gun, *T. Inabe 4* (KYO); Shiratori-jinja, Ishii-cho, Myosai-gun, *S. Takafuji 1340* (KYO); Dairyujisan, Kamodani-yama, Naka-gun, *T. Inabe 105* (TI). — Kagawa: Kannonji-shi, 50 m, *M. Takahashi 1170* (KYO). — Ehime: Ichinomiya-jinja, Kaneko-mura, Nii-gun, *T. Oda 1544* (TNS); Shiroyama, Uwajima, *T. Nakai* (TI). — Kochi: Muroto-misaki, 160 m, *S. Fujii 2063* (KYO); Kochi, *U. Faurie 11908* (KYO); Yokonami, Tosa-shi, near sea level, *G. Murata et al. 331* (KYO); Ioki-do, Aki-shi, near sea level, *K. Minoro et al. 5558* (KYO); Yasuda-cho, Aki-gun, *M. Tagawa 868* (KYO, TNS); Katsura-hama, Nagahama-cho, Agawa-gun, *H. Ito* (TI); Onogo-mura, Takaoka-gun, *H. Ito* (TI); Honokawa-yama, Takaoka-gun, *H. Ito* (TI); between Usa and Uranouchi, Takaoka-gun, *G. Murata 11300* (KYO). **Kyushu**. Fukuoka: Hiraodai, Kokura-shi, 200 m, *N. Fukuoka & Inamasu 830* (KYO); Mt. Abura-yama, *Y. Momiyama* (TI); Shiouji-san, *T. Osada 583* (TNS). — Saga: Irino-son, Nishimatsuura-gun, *Z. Tashiro* (KYO); Mt. Mifune-yama, Takeo-shi, *K. Oka 44361* (KYO); Mt. Kurokami-san, Arita-cho, 100–518 m, *Y. Tateishi & H. Hoshi* (TI), *H. Nagamasu 1895* (KYO). — Nagasaki: Nagasaki, *Maximowicz* (TNS, W), *S. Kitamura* (KYO), *N. Kinashi 1904* (KYO), *U. Faurie* (KYO), *B. Hayata* (TI), *F.C. Greatrex 27a/33* (TI); Urakami, *Y. Tashiro 38* (TI). — Kumamoto: Amitsu-sanchi, Uto-shi, *Y. Shimada 11370B* (YNS); Mt. Shodaisan, Tamana-shi, *Y. Shimada 8109B* (TNS); Miyaji-mura, Yatsuhiro-gun, *T. Nakajima* (TI); Mt. Kura-dake, Aso-gun, *H. Taka-*

hashi (TI); Konose, Kuma-mura, Kuma-gun, 150 m, *N. Fukuoka 10813* (KYO). — Oita: Minamiamabe-gun, *M. Ogata 388, 391* (KYO). — Miyazaki: Mukabakiyama, *S. Kato* (KYO); Mimitsu, *K. Narita TNS9954* (TNS); Hosojima, *S. Kitamura* (KYO); Gongen-dani, Kitazato-mura, Minaminaka-gun, *I. Hurusawa & S. Hattori 353* (TI). — Kagoshima: Akune, *S. Muramatsu 48* (KYO, TI); Takakuma-keiko-ku, 200–300 m, *S. Mitsuta et al. 49* (KYO); Maruo, Kirishima-san, *Z. Tashiro* (KYO); Uchinomaki, *T. Nakai* (TI); Uchinoura, *I. Hurusawa* (TI); Mt. Hoyoshi-dake, *Y. Momiyama* (TI); Hama-koen, Kagoshima-shi, *G. Murata & H. Tabata 312* (KYO); Yeboshi-dake, Kagoshima-shi, *T. Yamazaki & H. Ohba 534* (KYO, TI), 200 m, *S. Hatusima 20976* (KYO, TI). Yakushima Is.: *U. Faurie 4142* (KYO), *G. Koidzumi* (KYO), *Z. Tashiro* (KYO), *G. Masamune* (TI); Mt. Yoshida-dake, Miyanoura-gawa, 400 m, *Suzuki et al.* (TI); Menoko, 60–80 m, *S. Mitsuta et al. 156* (KYO); Ambo–Kosugidani, 100–700 m, *M. Kato & H. Kurosaki 53* (KYO); Hanayama, *S. Mitsuta & H. Doei 65* (KYO), 800 m, *G. Murata et al.* (KYO); Kusukawa-Kosugidani, *M. Tagawa 1833* (KYO). **Ryukyu**. Kagoshima. Amami-oshima Is.: *H. Ohba* (KYO); Naze, *H. Ohba* (KYO); Yuwan-dake, *H. Ohba 8* (KYO); Okaneku-Hukumoto-Naon, 300 m, *Y. Miyagi & S. Hatusima 40215* (RYU). — Okinawa. Okinawa Is.: Oku, *S. Hatusima 35161* (RYU); Nishime-dake, *G. Murata et al. 56771* (KYO); Sade, Kunigami, *G. Koidzumi* (KYO); Mt. Yonaha-dake, *E. Nakahara* (RYU), *Y. Niiro 2254* (RYU), 300 m, *T. Yamazaki 195* (KYO, RYU, TI); Yona, *Y. Miyagi 3714* (RYU); Mt. Iyu, 446.2 m, *Y. Miyagi 5241* (RYU); Fuku-gawa, *S. Hatusima 34156* (RYU); Mt. Nago-dake, *S. Hatusima 34777* (RYU); Gaji-rindo, *H. Higa RYU18977* (RYU). Kume Is.: Ue-gusuku, *S. Tawada 274* (KYO). Ishigaki Is.: Urasoko, *E. Takamine 2208* (RYU); Mt. Omoto-dake, *S. Hatusima 34745*, 100–523 m, *H. Nagamasu 963, 1004* (KYO), *N. Fukuoka & M. Ito 233* (KYO), *F. Yamazaki et al.* (TI), *M. Furuse 877, 2747, 3368, 3808* (RYU). Iriomote Is.: *G. Koidzumi* (KYO); Takabishi, Funaura, *Y. Miyagi 9609* (RYU); the upper stream of Urauchi to Komi, *F. Yamazaki et al.* (TI); Urauchi River, *Y. Kimura & I. Hurusawa* (TI); Mt. Goza-dake, *T. Yamazaki* (TI), 100–400 m, *C & Y. Miyagi 8120* (RYU); Otomi, *M. Furuse 974* (RYU); Mt. Komi, 200 m, *S. Hatusima 33105* (RYU).

TAIWAN. Taipei: Kelung, *U. Faurie 312* (KYO, TI, W); Sozan, *K. Kimura* (KYO); Sinten, *K. Odashima 17773* (KYO, TI, TNS, W); Tamsuy, *R. Oldham 295* (W); Shiratsuku, Shinko, *T. Kawakami & U. Mori 1320* (TI); Pihu, *C.-M. Kuo 6654* (KYO); Yuanshan, *T.-C. Huang 2367* (TI); Urai, *I. Sasaki 189* (TI); Nuannuan, *C.-M. Kuo 5833* (TI). — Nantou: Riyue Tan, *Y. Kimura & I. Hurusawa* (TI).

CHINA. Zhejiang: Region 20 to 40 miles west of Wenchow, 250–450 m, *R.-C. Ching 1887* (W); Pingyung, *R.-C. Ching 1990* (W). — Fujian: Minhouw Hsien, Kushan Monastery, *H.-H. Chung 2264* (W). Hunan: Changning Hsien, I-Chia-Ao, 300 m, *C.-S. Fan & Y.-Y. Li 154* (W). — Guangdong: Tai Mo Shan, Tapu Distr., *W.-T. Tsang 21015, 21219* (KYO); Ng-Tung Shan, San-on Distr., 3080', *T.-M. Tsui 268, 275* (KYO). — Hongkong: *S.-Y. Hu 5089* (TI); New Territory, Clear Water Bay, *Y.-W. Taam 1418* (KYO); Saigon, *W.-Y. Chun 6836* (W). — Guangxi: Yaoshan, *? 364* (W). — Hainan: Pak Shik Ling and vicinity, Ku Tung Village, Ching Mai Distr., *C.-I. Lei 245* (KYO, TI, W), *617* (KYO, TI, W); Bak sa, *S.-K. Lau 26062* (KYO).

Sect. 6. **Glomeratae** Y.-F. Wu

16. **Symplocos stellaris** Brand — Fig. 3-16 & 4e, Map 15, Plate 64c–d & 65a–d.

S. stellaris Brand, Bot. Jahrb. 29: 528 (1900); Pfl. R. Heft 6: 68 (1901); Sargent, Pl. Wils. 2: 597 (1916); Rehder, J. Arn. Arb. 15: 301 (1934); Hand.-Mazz., Beih. Bot. Centralbl. 62B: 31 (1943); Li, J. Wash. Ac. Sc. 43: 109 (1953); Liu, Lign. Pl. Taiwan: 1056, t. 880 (1962); Li, Wood. Fl. Taiwan: 744 (1963); Hatusima, Fl. Ryukyus: 479 (1971); Nooteboom, Leid. Bot. Ser. 1: 282 (1975); S.-S. Ying, Bull. Exp. For. Nat. Taiwan Univ. 116: 552 (1975); Nooteboom in Li et al., Fl. Taiwan 4: 129 (1978); Wu, Acta Phytotax. Sin. 24: 284 (1986); Fl. Reip. Pop. Sin. 60(2): 64, t. 24 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 190-4 (1989); Shimabuku, Check List Ryukyu Is.: 354 (1990). — *Bobua stellaris* Migo, Bot. Mag. Tokyo 56: 267 (1942). — *Dicalix stellaris* Migo, Shangh. Sizenk. Kenk. Iho 13: 206 (1943). — Type: *Bock & von Rosthorn 135* (W!, Plate 64c), Setschwan, Nanchuan, China.

S. tashiroi Matsumura, Bot. Mag. Tokyo 15: 77 (1901); Ind. Pl. Jap. 2(2): 488 (1912), 'tasiroi'. — *S. glauca* var. *tashiroi* Walker, J. Jap. Bot. 46: 68 (1971); Fl. Okinawa South. Ryukyu Is.: 832 (1976). — Lectotype: *Y. Tashiro* (TI!), Kushi, Okinawa Is. (designated here).

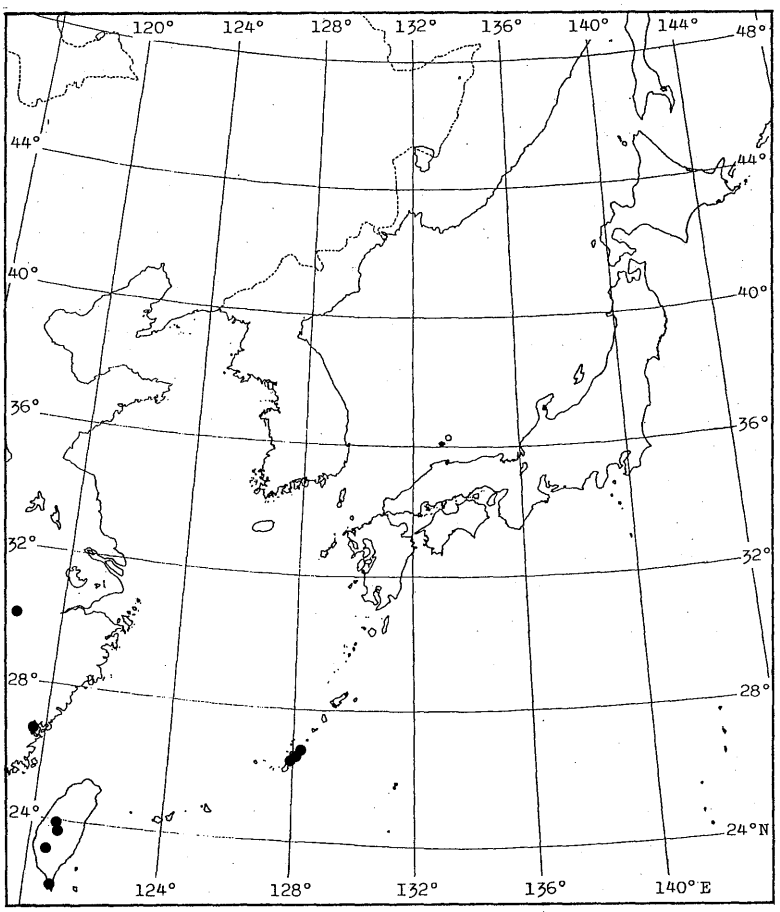
S. wilsonii Hemsley, Kew Bull.: 161 (1906). — Type: *Wilson 4067* (K!, Plate 65a), Szechwan.

S. dunniana Lév., Fedde Repert. 9: 445 (1911). — Type: *Cavalerie 3016* (E! Plate 65b, isotype in K!), Kweichow, Pin fa.

Litsea chaffanjoni Lév., Fedde Repert. 12: 182 (1913). — Type: *Chaffanjon (Bodinier) 2244* (E! Plate 65c, isotype in P), Kweichow, environs de Kouy Yang, Mont du Collège.

S. eriobotryaefolia Hayata, Icon. Pl. Form. 5: 98, t. 26 & pl. X (1915); Kanehira, Form. Tr.: 354, t. (1917); Makino & Nemoto, Fl. Jap. ed. 2: 919 (1931); Mori, Sylvia 5: 227 (1934); Kanehira, Form. Tr. rev. ed.: 584, t. 541 (1936). — *Bobua eriobotryaefolia* Kanehira & Sasaki, List. Pl. Form.: 330 (1928); Sasaki, Cat. Govt. Herb.: 407 (1930). — Syntypes: *T. Doi* (TAI, *non vidi*), Rinkiho; *B. Hayata* (TAI, *non vidi*), Mt. Arisan, inter Heishana et Nimandaira ad 6500 ped. alt., April 1914. Taiwan.

S. limprichtii Winkler, Fedde Repert. Beih. 12: 461 (1922). — Type: *Limpricht 1287* (B, K! Plate 65d, S), Szechwan, Kwan Hsien, China.



Map 15. Distribution of *Symplocos stellaris* Brand.

Evergreen shrubs or small trees. Twigs dark brown, terete, the pith regularly lamellate; young twigs thick, grayish, red-brown tomentose and soon glabrescent, ridged below petioles. Terminal buds ovoid to obliquely ovoid, red-brown tementose, 5–7 mm long. *Leaves*: blades thick coriaceous, narrowly elliptic, narrowly oblong or narrowly obovate, 8–

15(–22) cm long, (2–)2.5–5(–6) cm wide; apex acute to short acuminate; base cuneate to short attenuate, rarely rounded; margin (often much) recurved, entire but often distally with glandular teeth; upper surface shining, glabrous; lower surface glaucous, glabrous or rarely sparsely hairy on midrib; midrib impressed on upper surface but often slightly prominent near base, very prominent on lower surface; nerves 7–16 pairs, impressed on upper surface, slightly prominent on lower surface; reticulation obscure on lower surface; petioles glabrous or sparsely hairy, adaxially sulcate, 10–40 mm long. *Inflorescence* a condensed spike, on twigs and/or from axils of leaves, to 1 cm long; bracts orbicular to widely ovate, 2–4 mm long, apex obtuse, abruptly acute, sometimes with few glandular teeth on distal margin; bracteoles 2, obliquely oblong to obliquely ovate, (1.5–)2–3 mm long, apex rounded; both persistent, inside glabrous, outside rusty tomentose, margin ciliate. *Flowers*: calyx tube glabrous, about 1 mm high; calyx limb 1.5–2 mm long; calyx lobes ovate, 1–1.5(–2) mm long, rusty tomentose, margin ciliate; corolla white, 7–9 mm long, deeply 5-lobed, lobes elliptic, ciliate on distal margin; corolla tube 1.5–2 mm long; stamens 20–40, pentadelphous; disk cylindrical, glabrous, 0.5–1 mm high; style glabrous 9–13 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* bluish black, narrowly ovoid, often slightly curved, 7–10 mm by 3–5 mm excluding persistent calyx lobes; stones narrowly ovoid, with 10 lengthwise grooves; mesocarp thin; endocarp woody; seed 1, straight, with straight embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum corrugate, surface densely papillose and globulate; ora transversely elliptic; 25.0–28.9 μm (P) × 31.8–34.3 μm (E); pollen type IIe. —Flowers: Mar.–Apr. Fruits: Apr.–June (following year).

Jap. name: Yanbaru-mimizubai

Chrom. numb. n = 11.

Habitat. Subtropical evergreen forests.

Distr. Japan (Ryukyu: Okinawa Is.), Taiwan, S China.

JAPAN. **Ryukyu**. Okinawa Is.: Kushi, *Tashiro* (TI), *S. Tanaka 179* (TI, Plate 12d); Mt. Nishime-dake, *Miyazato* (RYU); Gaji-rindo, *T. Shinzato* (RYU); Aha, *M. Furuse 4807, 4809* (RYU), 20–60 m, *S. Mitsuta & H. Nagamasu 860, 862* (KYO); Kesaji, *Z. Tashiro* (KYO); Mt. Yonaha-dake, *Z. Tashiro* (KYO), *Y. Miyagi 3274, 3664* (RYU); Okuma-san, Kunigami, *T. Kinjo 248* (KYO); Genka-san, *S. Sakaguchi* (KYO); Sosu, *Z. Tashiro* (KYO); Sade, *S. Sonohara* (KYO), *G. Koidzumi* (KYO); Benoki-gawa, *Y. Miyagi & Hatusima 37126* (RYU); Benoki-yama, *S. Murata 1734* (RYU); Mt. Nagodake, *H. Kuroiwa* (KYO), *T. Shimizu 86-255* (KYO), *Hatusima 34773A* (RYU), 80–345.2 m, *H. Nagamasu 1465, 1663, 2398, 3401* (KYO); Nakagami, *G. Koidzumi* (KYO); Kuru-san, Nakagami, *S. Tawada 271, 272* (KYO); Mt. Tanodake, the summit, *Hatusima 34780* (RYU); Mt. Tanyu-dake, 150 m, *S. Hatusima 18043* (TI).

TAIWAN. Nantou: Fengshan, Chitou, 1500 m, *T. Yamazaki & F. Yamazaki 150* (TI). —Chiayi: Arisan, *U. Faurie 178* (KYO), *S. Kokawa 82* (KYO), *T. Satow 202* (TI). —Kaohsiung: Qishan, *K. Mori* (TI). —Pingtung: Ken-ting, *H. Izumi & M. Togashi* (TI).

CHINA. Anhui: Huangshan, *S.-S. Chien 1033* (W). —Fujian: Foochow, *H.-H. Chung 2208* (W). —Jiangxi: Mt. Lu-shan, *M. Takahashi* (TI). —Guangdong: Sam Kok Shan, Tsungfa-Lungmoon Distr., *W.-T. Tsang 20448* (KYO, TI); Sam Kok Shan, Ch'an Woh T'ung Village, Tsungfa Distr., *W.-T. Tsang 25000* (KYO); Sam Kok Shan, Cheung Uk Village, Tsungfa Distr., *W.-T. Tsang 24915* (KYO); Ngok Shing Shan, Sai-lin-shan Village, Sin-fung Distr., *Y.-W. Taam 452, 544* (KYO); Chong Uen Shan near Kau Fung, Loh Ch'ang Distr., *W.-T. Tsang 20982* (KYO, W). —Sichuan: Nanchuan, *Bock & Rosthorn 135* (W). —Guizhou: Shihtsiensan Distr., *Y. Tsiang 4134* (TI); Fan Ching Shan, Ma Chao Ho, 1000 m, *A.N. Steward et al. 767* (W).

Sect. 7. **Palaeosymplocos** Brand

Key to the species

1a. Twigs conspicuously ridged, nearly winged; leaves revolute, upper surface rugose. ..... 22. *S. kawakamii*

1b. Twigs more or less ridged; leaves (slightly) recurved, upper surface not rugose.

2a. Inflorescences 1 to 3-flowered.

3a. Twigs thick, not zigzag; blades 6–9 cm long; inflorescences 1 to 3-flowered; calyx lobes of fruit bending inward, forming a blunt beak. ..... 20. *S. boninensis*

3b. Twigs slender, often zigzag; blades 3–6 cm long; inflorescences 1(–2)-flowered; calyx lobes of fruit erect or spreading, forming a crown. ..... 19. *S. pergracilis*

2b. Inflorescences more than 5-flowered.

4a. Blades 7–13 cm long; stamens more than 50 in number; ovary 3-locular; fruits globose to ellipsoid, 15–20 mm in diameter ..... 21. *S. tanakae*

4b. Blades 4–7 cm long; stamens 20–40 in number; ovary usually 2-locular; fruits ellipsoid, 5–9 mm in diameter.

5a. Bracteoles 1.5–2 mm long; corolla 3.5–4 mm long; fruits 6–10 mm excluding persistent calyx lobes. ..... 17. *S. nakaharae*

5b. Bracteoles 2–3 mm long; corolla (3.5–)4–5 mm long; fruits 9–13 mm long excluding persistent calyx lobes. ..... 18. *S. kuroki*

17. **Symplocos nakaharae** (Hayata) Masamune — Fig. 3-17, Map 16, Plate 66a.

S. nakaharae (Hayata) Masamune, Trans. Nat. Hist. Form. 30: 62 (1940); Nagamasu, Acta Phytotax. Geobot. 38: 289 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172 (1989). — *S. japonica* A. DC. var. *nakaharai* Hayata, Icon. Pl. Form. 5: 103 (1915); Masamune, Sc. Rep. Kanazawa Univ. 3(2): 61 (1958). — *S. lucida* Sieb. & Zucc. var. *nakaharai* Makino & Nemoto, Fl. Jap.: 373 (1925); Walker, Imp. Tr. Ryukyu Is.: 264 (1954). — *Bobua japonica* (A. DC.) Miers var. *nakaharai* Sasaki, Cat. Govt. Herb.: 407 (1930); Nemoto, Fl. Jap. Suppl.: 581 (1936). — *Dicalix lucida* (Thunb. *ex* Murray) Hara var. *nakaharai* Hara, Enum. Sperm. Jap. 1: 106 (1948). —Type: *G. Nakahara* (TI!, Plate 66a), Nagotake, Okinawa Is., Ryukyus.

S. lucida auct. *non* Wall. *ex* G. Don *nec* Sieb. & Zucc.: Makino & Nemoto, Fl. Jap.: 373 (1925); Ohwi, Fl. Jap.: 933 (1953); Hatusima, Fl. Ryukyus: 478 (1971); Nooteboom, Leid. Bot. Ser. 1: 217 (1975); Walker, Fl. Okinawa South. Ryukyu Is.: 831 (1976). *p. p., quoad pl. ex Ryukyus.*

S. japonica auct. *non* A. DC.: Masamune, Sc. Rep. Kanazawa Univ. 3(2): 61 (1955), *p. p., quoad pl. ex Ryukyus.*

Bobua japonica auct. *non* Miers: Nemoto, Fl. Jap. Suppl.: 581 (1936), *p. p., quoad pl. ex Ryukyus.*

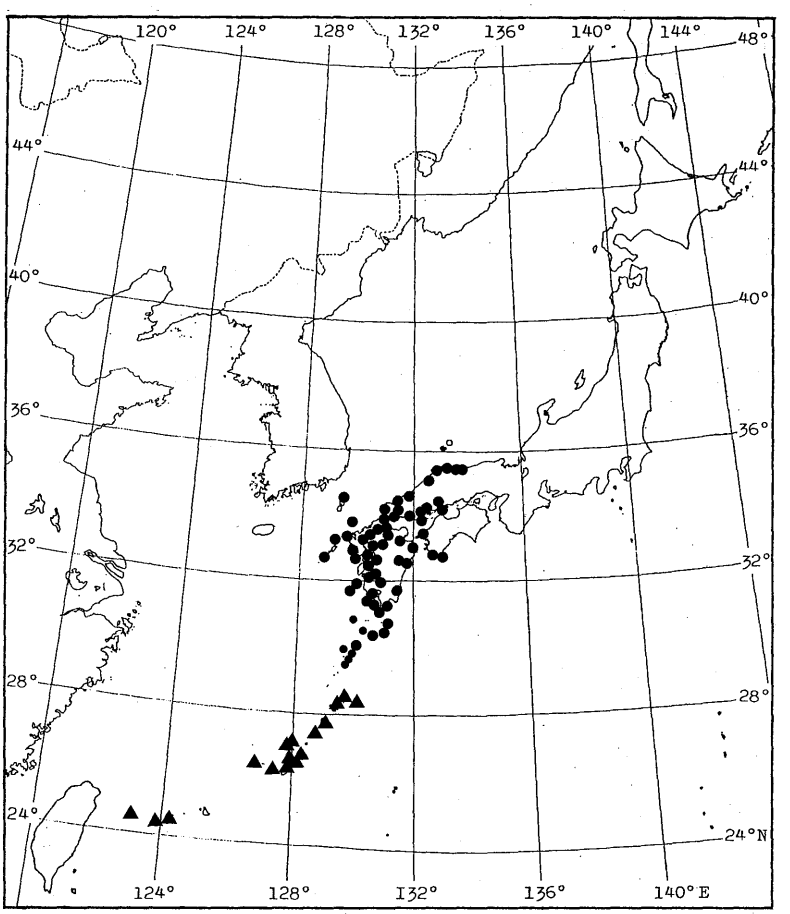
Small evergreen trees. Twigs ashy brown to dark brown, terete or ridged; young twigs green, glabrous, ridged below petioles. Terminal buds narrowly ovoid to subulate, acute to acuminate, often curved at apex, glabrous, 5–10 mm long. *Leaves*: blades coriaceous, elliptic, 4–7(–8) cm long, 1.5–3.5(–4.5) cm wide; apex rounded, obtuse to acuminate; base cuneate to shortly attenuate; margin recurved, entire or glandular-crenate with teeth 4–10 mm apart; both surfaces glabrous; midrib prominent on both surfaces; nerves 5–8 pairs, slightly prominent on both surfaces; petioles glabrous, adaxially sulcate, 4–10 mm long. *Inflorescence* an axillary spike, branched near base, to 1 cm long, axis puberulous; bracts and bracteoles persistent, inside glabrous, outside (sparsely) appressed pubescent, margin ciliolate; bracts ovate to semi-orbicular, sometimes split, 1–1.5 mm long, apex roudned or obtuse; bracteoles 2, depressed ovate to kidney-shaped, apex rounded, obtuse or acute, 1.5–2 mm long. *Flowers*: calyx tube glabrous, about 1 mm high; calyx limb 1–1.5(–2) mm long; calyx lobes imbricate, widely ovate to ovate, apex rounded or obtuse, glabrous,

ciliolate, 1–1.5(–2) mm long; corolla white, 3.5–4 mm long, deeply 5-lobed, the lobes elliptic; stamens 20–30(–35), pentadelphous; disk pulvinate, with 5 glands, densely soft pilose; style glabrous or pilose toward base, 4–4.5 mm long; ovary 2- (rarely 3-)locular. *Fruits* bluish black, ellipsoidal, 6–10 mm long, 5–7 mm in diameter, excluding blunt beak formed by the persistent calyx lobes; stones ellipsoid, rather smooth, 3–4 mm in diameter; mesocarp and endocarp woody; seeds 1(–2) in each locule, J-shaped to slightly curved with similarly curved embryo. *Pollen grains* 3-colporate, brevicolpate; semiangular in polar view, oblate to suboblate in equatorial view; tectum verrucate and partly corrugate; ora transversely elliptic; 19.7–20.0 μm (P) × 25.4–25.8 μm (E); pollen type IIb. —Flowers: Dec.–Feb. Fruits: Aug.–Sept.

Jap. name: Nakahara-kuroki, *Ryukyu-kuroki*

Habitat. Subtropical evergreen forests, often on ridges.

Distr. Japan (Ryukyu), endemic.



Map 16. Distribution of *Symplocos nakaharae* (Hayata) Masamune (triangle) and *S. kuroki* Nagamasu (disk). Small disks are based on the literature.

JAPAN. **Ryukyu**. Kagoshima. Amami-oshima Is.: Okatsu, *S. Kawagoe* (KYO); Kasari, *H. Ohba 25* (KYO); Akakina, Kasari-mura, 30 m, *S. Sako* (TI, RYU); Naze to Okuma, *H. Ohba 161* (KYO); Naze, *Z. Tashiro* (KYO); Sotsukatazaki, Nishikomi, Nishikata-son, *Z. Tashiro* (KYO); near the summit of Mt. Yuwan-dake, 660 m, *S. Sako 5303* (KAG, KYO, RYU); Uken, Uken-son, *M. Furuse 8062, 8064* (RYU); Mt. Jiwa-dake, near the summit, *M. Furuse 7945* (RYU). Kikai Is.: *Y. Miyagi 7303* (RYU), *Y. Yoshinaga 1421* (RYU). Tokunoshima Is.: the summit of Mt. Inokawa-dake, 640 m, *H. Nagamasu 1764* (KYO); Mt. Inokawa-dake, *T. Kabashima RYU32052* (RYU). Okinoerabu Is.: *S. Hatusima & Y. Miyagi 39057* (RYU); Wadomari, *H. Ohba 115, 137, 149, 178, 201* (KYO); Mt. Koshiyama, 100 m, *S. Hatusima & S. Sako 21411* (KAG, TI); Mt. Oyama, 190 m, *S. Hatusima & S. Sako 21569* (KAG, TI). — Okinawa. Okinawa Is.: *I. Nagatomo* (KYO), *T. Miyagusuku 773* (KYO); Oku, *Y. Miyagi 7997* (RYU, TI); Mt. Hedo-ishiyama, *S. Hatusima 33551* (RYU); Koen, *T. Miyagusuku 435* (KYO); Hentona-san, *S. Tawada 282* (KYO); Hentona, *T. Yamazaki* (TI, TNS); Benoki, *M. Furuse 5578* (RYU); Higashi-son, *Y. Niiro 3442* (RYU); Yona, *Nakamine 266* (TNS), *S. Tamagusuku* (RYU), *M. Furuse 1667* (RYU); Sade, Kunigami-gun, *G. Koidzumi* (KYO); Mt. Yonaha-dake, *S. Sakaguchi* (KYO); Kunigami-son, *Y. Miyagi* 1978 (KYO); Shoshi, Nakijin-son, *Z. Tashiro* (KYO); Nakijin-son, *E. Takamine 2057* (TNS), *2058* (RYU); Mt. Katsuu-dake, *C. Sakihara 106* (RYU), *Y. Miyagi 3861, 3950* (RYU); Nago, *Z. Tashiro* (KYO); Nago-cho, Koen, *T. Kaneshiro 881* (RYU); Mt. Nago-dake, *G. Nakahara* (TI), 200 m, *J. Murata 4714* (KYO, TI), 80–345.2 m, *H. Nagamasu 1470, 1488, 1971, 1991, 1996, 2002, 2397* (KYO); Nago-cho to Ikeda (Motobu-son), *H. Ohba 9* (KYO); Seifa-utaki, Chine, *K. Shimabuku 5247* (KYO, RYU); Haji, *T. Miyagi 70* (TI); Yaezu-dake, Tancha, Onna-son, *Nakamine 302* (TNS); Tanyu-dake, *S. Sonohara et al. 6304* (TI); Katsuyama, Yabe-son, *Y. Nakasone 79* (KYO); Unten, Yagaji, *G. Koidzumi* (KYO); Yagaji Islet, *Z. Tashiro* (KYO); Onna, Onna-son, *J. Matsumura* (TI), *Y. Takushi* 11328 (KYO), *E. Takamine 2377* (RYU); Onna-dake, *T. Ito 1084* (TNS); Kooroosan, Nakagami-son, *S. Tawada 280* (KYO); Misato, *S. Hatusima 17653* (TI); Ikehara, Misato-son, *S. Tawada 281*; Chibana, Misato-son, *N. Satomi 25815* (KYO); Shuri, *Sakaguchi* (KYO); prope Naha, *G. Koidzumi* (KYO). Iheya Is.: *H. Kuroiwa* (TI), *Y. Niiro 3004* (RYU). Izena Is.: *S. Hatusima 34821* (RYU); *E. Nakata* (RYU); Onoyama, 40–119 m, *M. Tamura et al. 26611* (KYO). Kerama Isls.: Tokashiki Is., *Y. Miyagi 1106* (RYU), *Y. Miyagi & T. Kabashima 4727* (RYU); Maedake, 50–120 m, Tokashiki Is., *Y. Miyagi 9173* (KYO, RYU, TI); Aka-jima Is., *Y. Miyagi & T. Kabashima 4972* (RYU); Geruma Is, *Y. Miyagi 7836* (RYU); Zamami Is., *S. Hatusima 33401* (RYU). Kume Is.: *H. Kuroiwa* (TI), *Y. Niiro 589* (RYU), *S. Hatusima 34303* (RYU); Shirase-gawa, *S. Tawada 284* (KYO); Nakazato-yama, Gushikawa-son, *T. Amano 7072* (RYU), *7089* (RYU, TNS); Gushikawa, *N. Satomi 25817* (TI). Ishigaki Is.: Kabira-mae-dake, *E. Takamine 2023* (RYU); Mt. Omoto-dake, 100–525.8 m, *G. Murata & H. Tabata 815* (KYO, TI, TNS), *H. Nagamasu 1032, 1048* (KYO). Iriomote Is.: *G. Koidzumi* (KYO); Mt. Komi-dake, 200 m, *S. Hatusima 33126* (RYU); Urauchi to Komi, *H. Okada et al. 281* (KYO, TI); Yutsun River to the summit of Mt. Komi-dake, 260–469 m, *S. Mitsuta & H. Nagamasu 393, 399* (KYO); Yutsun River to Maboroshi-no-ike Pond, 260–380 m, *S. Mitsuta & H. Nagamasu 428* (KYO). Yonaguni Is.: *G. Koidzumi* (KYO), *M. Furuse 1343* (RYU); Mt. Ubura, *S. Hatusima et al. 35814* (RYU); S slope of Donan-dake, 40–100 m, *H. Nagamasu 1539* (KYO).

18. **Symplocos kuroki** Nagamasu, **nom. nov.** — Fig. 3-18 & 4c, Map 16, Plate 66b.

S. kuroki Nagamasu — *Laurus lucida* Thunb. *ex* Murray, Syst. Veg. ed. 14: 384 (1784); Thunb., Fl. Jap.: 174 (1784). — *Hopea lucida* Thunb., Icon. Pl. Jap. 2, t. 4 (1800). — *Dicalix lucida* Hara, Enum. Sperm. Jap. 1: 105 (1948). — Type: *Thunberg* (UPS, microfiche!), Japan.

S. lucida (*non* Wall. *ex* G. Don, 1837 or 8 Mar.–8 Apr. 1838) *sensu* Sieb. & Zucc., Fl. Jap. 1: 55, t. 24 (1837 or early 1838), *p. p., quoad descr. et tab., excl. typ. et syn. Myrtus laevis*; Matsumura, Ind. Pl. Jap. 2(2) 487 (1912); Makino & Nemoto, Fl. Jap. ed. 2: 921 (1931); Ohwi, Fl. Jap.: 933 (1953); Kitamura & Murata, Wood. Pl. Jap. 1: 99, t. 120 (1971); Nooteboom, Leid. Bot. Ser. 1: 217 (1975); Nagamasu, Acta Phytotax. Geobot. 38: 288 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 189-4, 5 (1989); Shimabuku, Check List Ryukyu Is.: 353 (1990). — *S. japonica* A. DC., Prodr. 8: 255 (1844), *excl. typ.*; Sieb. & Zucc., Fam. Nat. 2: 133 (1846); Miq., Prol. Fl. Jap.: 265 (1867); Franch. & Sav., Enum. Pl. Jap. 1: 307 (1875); Brand, Pfl. R. Heft 6: 31 (1901). — *Bobua japonica* Miers, J. Linn. Soc. Bot. 17: 306 (1879), *excl. typ.*; Nakai, Tr. & Shr. ed. 1: 233, t. 130 (1922); *op. cit.* ed. 2: 315, t. 147 (1927).

Evergreen trees; bark dark brown, smooth. Twigs gray or dark brown, terete or ridged; young twigs green, glabrous, ridged below petioles. Terminal buds narrowly ovoid to subulate, acute to acuminate, usually curved at apex, glabrous, 6–15 mm long. *Leaves*: blades coriaceous, elliptic, narrowly elliptic(-oblong), obovate or narrowly obovate, 4–7 cm long, (1.5–)2–3.5 cm wide; apex obtuse or acute; base cuneate; margin recurved, entire or glandular-crenate with teeth 3–15 mm apart; both surfaces glabrous; midrib prominent on both surfaces; nerves 5–9 pairs, slightly prominent on both surfaces; reticulation obscure on lower surface; petioles glabrous, adaxially sulcate, 5–15 mm long. *Inflorescence* an axillary, contracted spike branched near base, to 1(–1.5) cm long, axis densely puberulous; bracts widely ovate to depressed ovate, often split, 2–3 mm long, apex rounded or acute; bracteoles 2, depressed ovate to kidney-shaped, often keeled, rounded or acute at apex, 2.5–3 mm long; both persistent, inside glabrous, outside appressedly pubescent and ciliolate. *Flowers*: calyx tube glabrous, 1–1.5 mm high; calyx limb 1.5–2.5 mm long; calyx lobes imbricate, widely ovate to ovate, rounded at apex, glabrous or rarely appressed pubescent, ciliolate, 1.5–2.5 mm long; corolla white, (3.5–)4–5 mm long, deeply 5-lobed, the lobes elliptic; corolla tube about 1 mm long; stamens pentadelphous, 25–40; disk pulvinate with 5 glands, densely soft pilose; style glabrous (3.5–)4–6 mm long; ovary 2- (rarely 3-)locular. *Fruits* bluish black, 2- (rarely 3-) locular, ellipsoid, 9–13 mm long, 6–9 mm in diameter, excluding blunt beak formed by the persistent calyx lobes; stones ellipsoid, rather smooth, about 5 mm in diameter; mesocarp and endocarp woody; seeds 1–2(–3) in each locule, J-shaped to slightly curved with similarly curved embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate to oblate in equatorial view; tectum corrugate and partly verrucate; ora transversely elliptic; 18.7–18.8 μm (P) × 23.6–24.0 μm (E); pollen type IIb. —Flowers: Dec.–Apr. Fruits: Sept.–Nov.

Jap. name: Kuroki

Habitat. Warm temperate evergreen forests.

Distr. Japan (Honshu, Shikoku, Kyushu), endemic.

JAPAN. **Honshu**. Tottori: Kusaka-son, Tohaku-gun, *Y. Ikoma* (KYO); Mt. Daisen, *Z. Tashiro* (KYO); *K. Hisauchi 662* (TI). —Shimane: Arashima-son, Nogi-gun, *R. Kishino* (KYO); near Matsue, *R. Kishino* (KYO); Izumotaisha, *S. Okuyama 17723* (TNS); Shizuma-son, Nima-gun, *S. Takaki & E. Matsubara 131* (KYO); Ukinuno-ike in Mt. Sanbe, Ota-shi, 400 m, *G. Murata 22136* (KYO, TI, TNS). —Hiroshima: Muko-jima, Hiroshima-shi, *T. Yamazaki 432* (TI, TNS); Hiji-yama, Hiroshima-shi, *Y. Miyagi 238* (KYO); Osakikami-jima, Higashino-cho, Toyota-gun, *Z. Tashiro* (KYO), *G. Murata 22314* (KYO); Gokurakuji-yama, *Z. Tashiro* (KYO); Takehara-cho, *Kato* (KYO); Miya-jima, Saeki-gun, *H. Akiyama 8929* (KYO); *F. Shimozono* (TI). —Yamaguchi: Shimonoseki, *U. Faurie 3100* (KYO), *Z. Tashiro* (KYO), *H. Migo* (KYO); Akiyoshidai, *Z. Tashiro* (KYO, TNS); Hikari-shi, *M. Togashi 1800* (KYO, TI, TNS); Shuhodo, Mine-gun, *H. Migo* (KYO); Shiroyama, Iwakuni-shi, *M. Tagawa 2451* (KYO); Ohori, Yamaguchi-shi, *H. Migo* (KYO); Kurokami-jima, Tomita, Tsuno-gun, *H. Migo* (KYO); Maruo, Ube-shi, *H. Migo* (KYO); Kurae, Yamada-son, Abu-gun, *J. Nishina* (KYO); Taika-san, Tokuyama-shi, 300 m, *M. Umebayashi 12, 30* (KYO); Ko-jinja, Tokuyama-shi, 50 m, *M. Umebayashi 393* (KYO); Kyodai-shikenchi, Tokuyama, *S. Okamoto* (KYO); Kogushi, Kawatana, Toyoura-machi, 20–120 m, *N. Kurosaki 8994, 8997* (KYO), *J. Murata 9535* (KYO, TI); Shizuki-san, Hagi-shi, *H. Hara & S. Kurosawa* (TI); Yashiro-jima, Mt. Monju-san, 350–600 m, *J. Murata 9601* (TI); Mukai-jima, Hofu-shi, *K. Oka* (KYO). **Shikoku**. Ehime: Kawanagata, Ikata-son, Nishiuwa-gun, *Y. Nomura 10* (KYO). —Kochi: Odo-government-forest, Otsuki-sho, Hata-gun, *G. Murata 17978* (KYO, TNS); Kashiwa-jima, Hata-gun, *H. Yamamoto TNS22755* (TNS); Ohama to Ashizuri-misaki, Tosashimizu-shi, 70 m, *N. Fukuoka 10565* (KYO). **Kyushu**. Fukuoka: Moji, Kojo-yama, *T. Hashimoto* (TI); Moji, Shizuchi-

yama, *T. Hashimoto* (TI); Adachi-yama, Moji, *T. Hashimoto* (TI); circa Kukura, *U. Faurie 5529* (KYO); Togamiyama, Osato, *T. Sugino* (KYO); Jingo to Hirao, Hiraodai, 200 m, *N. Kurosaki & Y. Inamasu 850* (KYO, TNS); Kawara-dake, *Anonymous 3052* (TNS); the summit of Toishi-yama to Kurobaru, Chikuho-cho, Kaho-gun, 200–850 m, *N. Kurosaki 9847* (KYO, TI); Abura-yama, *Anonymous* (TI), *H. Yamamoto 4579* (TNS); Mt. Hiko-san, *J. Ouchi (S. Okuyama 200)* (TNS). — Saga: Omagari, Higashisefuri-son, Kanzaki-gun, *T. Baba 50* (TNS); Kitataku-cho, Taku-shi, *T. Baba* (TNS). — Nagasaki: circa Nagasaki, *U. Faurie 3101* (KYO), *Maximowicz* (TNS); Hirayama to the top of Mt. Hachirodake, Nagasaki-shi, *N. Fujita 596* (KYO); Mt. Hichimen-yama of Mayuyama, Shimabara-shi, *N. Naruhashi 3040* (KYO); Mt. Unzen, *Y. Tashiro* (TI), *J. Matsumura & G. Koidzumi* (TI); Isaura-gawa, Nishisonogi-gun, *H. Ohba & K. Midorikawa 302* (TI); Omura, *Z. Tashiro* (KYO); Jo-yama, Hoshika-cho, Matsuura-shi, 20–125.6 m, *H. Nagamasu 1827* (KYO); Azuchi, O-shima, *Z. Tashiro* (KYO, TNS); Yasuman-dake, Hirado-shi, *S. Kitamura* (KYO), 200 m, *N. Fujita & S. Mitsuta 22* (KYO); Funaki, Hirado, about sea level, *M. Hotta & M. Ito 80* (KYO). Iki Is.: Komaki-fure-higashi, Gonoura-cho, *K. Mimoro 1701* (KYO). Tsushima Is.: *U. Faurie 4804* (KYO), *T. Nakai* (TI); Toyo to Toorazuhama, Kamitsushima-cho, Kamiagata-gun, up to 20 m, *N. Fukuoka 7854* (KYO, RYU, TI). Goto Isls., Fukue Is.: Arakawa, Tamanoura-cho, 0–30 m, *K. Ueda et al. 1337* (KYO); Terawaki, Kisugi-sho, 100 m, *G. Murata & H. Koyama 14556* (KYO); Mt. Oto-zan, Yoshida-cho, Fukue-shi, 60–100 m, *N. Fukuoka & N. Kurosaki 3723* (KYO); Shiratori-jinja, 60 m, *H. Taoka 3623* (KYO). Goto Isls., Uku Is.: NE foot of Mt. Jogatake 100 m, *Y. Tateishi 4669* (TI). — Kumamoto: Akada, Arao-shi, *Y. Shimada 11377* (KYO); Gyokuto-cho, Tamana-gun, *Y. Shimada 13483* (KYO); Misumi-dake, Udo-gun, *Y. Shimada 11375* (KYO); Uchinomaki, *M. Togashi 1427* (KYO, TI); Kume-mura, Kuma-gun, *Y. Nabeshima* (KYO); Oura, Kamishima, Amakusa-gun, *T. Yamazaki* (TI); Yunoko-jima, Minamata-shi, *Y. Shimada 8128B* (TNS). — Oita: Beppu, *T. Nakai* (TI); Oita-shi, Takashiro, *Y. Shimada 8123B* (TNS); Tsukumi-jima, *Z. Tashiro* (KYO). — Miyazaki: Totoro, *K. Narita TNS9952* (TNS); Hosojima, *S. Kitamura* (KYO); Yamage, Togo, Higashiusuki-gun, *H. Kanai* (TI); Futobaru, Obi-cho, Naka-gun, *S. Hattori & I. Hurusawa 342, 367* (TI), *S. Hattori 17* (TNS). — Kagoshima: Yunono, Mt. Kirishima, *M. Nagasawa* (TI); Noma-dake, *I. Inami* (KYO); Yaseo, Kawanabe-gun, *M. Shinagawa* (KYO); Shiroyama, Kagoshima-shi, *T. Nakai* (TI); Akakuebana, Makurazaki-shi, *S. Kitamura & G. Murata 2913, 2925* (KYO); near Fukiagehama-eki, Fukiage-cho, Hioki-gun, 30 m, *N. Kurosaki 10837* (KYO); Bonotsu-cho, Kawanabe-gun, *S. Kitamura & G. Murata 2891* (KYO); Ikeda-ko, *Z. Tashiro* (KYO, TNS); Satsuma-gun, *Z. Tashiro* (KYO); Sata-misaki, *N. Fukuoka 3289* (KYO), *S. Kitamura* (KYO), *G. Murata 12891* (KYO); Odomari to Tajiri, Sata-cho, Kimotsuki-gun, *A. Nitta 2* (KYO); Odomari to Satonoura, Sata-cho, 100 m, *T. Yamazaki & H. Ohba 400* (KYO, TI); Minashiri, Uchinomaki-cho, *M. Tagawa & K. Iwatsuki 4036* (KYO); Funayuki, Uchinoura, *Z. Tashiro* (KYO); Kajiki, *Z. Tashiro* (KYO). Koshiki-jima Is.: Kuwanoura, Kamikoshiki-mura, *A. Nitta 388* (KYO); Shimokoshiki-jima, Seo, near Kannon-daki, 200 m, *M. Togashi TNS273076* (TI, TNS). Tanegashima Is.: *U. Faurie 307* (KYO), *Anonymous* (TI); Nishino'omote, *Suzuki et al* (TI); Onigasawa, N of Nishino'omote, *K. Iwatsuki 4173* (KYO); upper course of Shikanaki-zawa, *K. Iwatsuki 4107* (KYO). Yaku-shima Is.: *G. Koidzumi* (KYO), *H. Uramatsu* (TI), *G. Masamune* (TI); Miyanoura, *S. Okamoto* (KYO); Menokawa, 40–80 m, *J. Murata et al. 17723* (KYO, TI); Onnagawa, Kamiyaku-cho, *T. Yahara et al. 9029* (KYO, TI); Hinokuchi to Hirao, 10–60 m, *T. Yahara et al. 9093* (TI); Funayuki, seashore, *J. Murata & S. Sakai 17209* (TI); Kurio-Yudomari, 50 m, *Suzuki et al.* (TI); Onoaida, *T. Yamazaki* (TI); Segire River to Nagata, 100–300 m, *G. Murata et al. 40* (KYO). Tokara Isls.: Kuchinoshima Is., 150 m, *S. Sako 7127* (KAG, KYO, TI).

Notes. 1. When *Symplocos lucida* Sieb. & Zucc. (Fl. Jap. 1: 55, 1837 or early 1838) was published, *Kuroggi* Kaempfer, Amoen. exot. 788 (1712) and *Myrtus laevis* Thunb., Fl. Jap. 198 (1784) were cited as synonyms. As the type of *Myrtus laevis* was not excluded in the description, the basionym of *S. lucida* Sieb. & Zucc. is *Myrtus laevis* Thunb. *ex* Murray [= *Pourthiaea villosa* (Thunb. *ex* Murray) Decne. var. *laevis* (Thunb. *ex* Murray) Stapf, Rosaceae].

A. DeCandole published a new name *S. japonica* for *S. lucida* Sieb. & Zucc. giving the priority to another homonym *S. lucida* Wall. *ex* G. Don (1837 or 1838). *Symplocos japonica* A. DC. also should be nomenclaturally based on *Myrtus laevis* Thunb. *ex* Murray, be-

cause he cited only *S. lucida* Sieb. & Zucc. without excluding *Myrtus laevis*.

2. Nooteboom (1975) considered that *S. lucida* Sieb. & Zucc. was based on *Laurus lucida* Thunb., Fl. Jap. 174 (1784). These two names should be, however, considered to be heterotypic, because Siebold & Zuccarini never cited *Laurus lucida* Thunb. Although *Laurus lucida* is the oldest synonym of this species, Thunberg's epithet '*lucida*' is not available under the genus *Symplocos* because there are earlier homonyms, *S. lucida* Wall. *ex* G. Don and *S. lucida* Sieb. & Zucc. Therefore, I propose a new name, *S. kuroki* based on *Laurus lucida* Thunb. *ex* Murray. The new epithet '*kuroki*' is a Japanese vernacular name for this species.

19. **Symplocos pergracilis** (Nakai) Yamazaki — Fig. 3-19, Map 17, Plate 66c.

S. pergracilis (Nakai) Yamazaki, J. Jap. Bot. 44: 366 (1969); Toyoda, Fl. Bonin Is.: 155, photo 70, t. 70 (1981); Nagamasu, Acta Phytotax. Geobot. 38: 290 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 189-1, 2 (1989). — *Bobua pergracilis* Nakai, [Rigakkai 26(5): 7 (1928), *nomen, non vidi*] Bot. Mag. Tokyo 44: 24 (1930); Nemoto, Fl. Jap. Suppl.: 583 (1936). — *Dicalix pergracilis* Hara, Enum. Sperm. Jap. 1: 106 (1948). — Type: *H. Toyoshima* (TI!, Plate 66c), Takeda bokujyo insulae Chichijimae, Bonin Isls.

S. boninensis sensu Rehder & Wilson, J. Arn. Arb. 1: 119 (1919), *p. p., quoad pl. ex Chichijima*; Nooteboom, Leid. Bot. Ser. 1: 133 (1975).

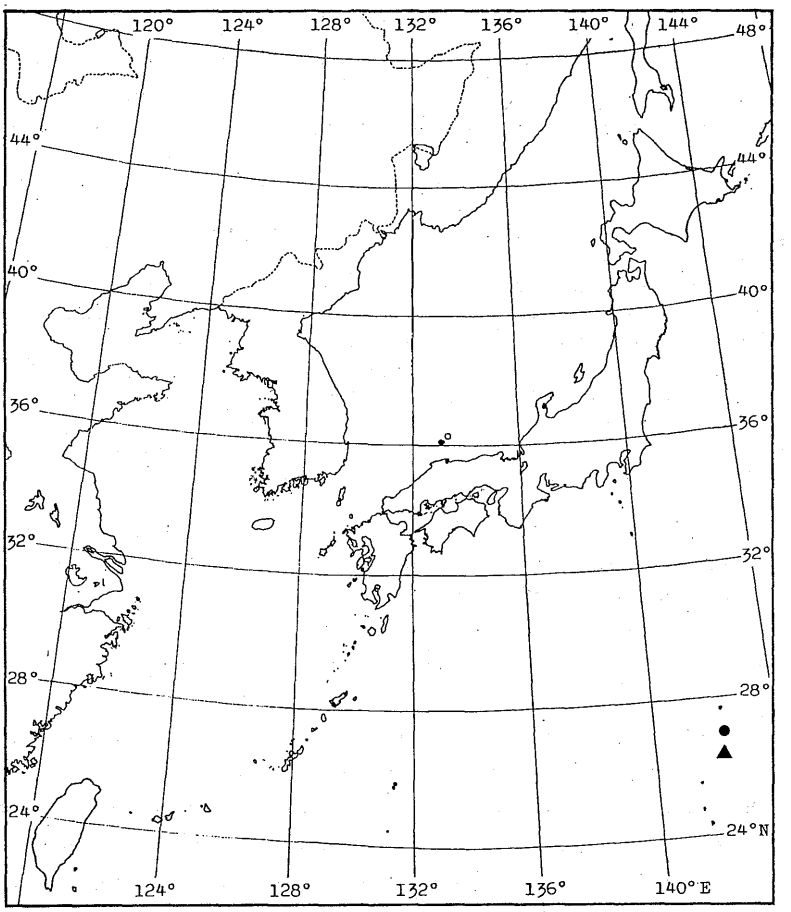
Small evergreen trees. Twigs green or brown, terete; young twigs slender, 1–2 mm in diameter, green, often tinged violet, glabrous, ridged below petioles. Terminal buds subulate, often curved, glabrous, 6–15 mm long. *Leaves*: blades coriaceous, obovate to narrowly obovate, (2.5–)3–6 cm long, 1–2.5(–3) cm wide; apex acute, obtuse or rounded; base attenuate; margin recurved, entire or slightly glandular-crenate with teeth 3–7 mm apart; both surfaces glabrous; midrib prominent to slightly sulcate on upper surface, prominent on lower surface; nerves 6–8 pairs, obscure on lower surface; petioles glabrous, narrowly winged, often tinged with violet, 7–15 mm long. *Inflorescence* axillary, a reduced contracted spike, rarely branched at base, to 5 mm long, 1(–2)-flowered; axis with several persistent sterile bracts; bracts orbicular to transversely widely elliptic, rounded at apex, glabrous, margin ciliolate, 2–3.5 mm long. *Flowers*: calyx tube glabrous, about 1 mm high; calyx limb about 3.5 mm long; calyx lobes imbricate, semi-orbicular to kidney-shaped, rounded at apex, glabrous, 3–3.5 mm long, margin ciliolate; corolla white, 6–7 mm long, deeply 5-lobed, the lobes elliptic, ciliolate; corolla tube about 1 mm high; stamens 100–120 (1 specimen examined), pentadelphous; disk pulvinate to flat, 5-glandular, soft pilose; style glabrous or sparsely pilose the base, 5–6 mm long; ovary 3-locular. *Fruits* 3-locular, (obliquely) narrowly obovoid or narrowly ellipsoidal, 18–25 mm long, 7–12 mm in diameter, excluding calyx lobes; calyx lobes persistent, erect or spread, forming a crown; stones trigonous, smooth or slightly grooved lengthwise, base acute; mesocarp and endocarp woody; seeds 1–2 in each locule, straight, with straight embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum gemmate and globulate; globules striately sculptured; ora transeversely elliptic; 20.5–22.2 μm (P) × 28.7–29.6 μm (E); pollen type IIb. — Flowers: Nov.–Dec. Fruits: Nov.–Dec. (following year).

Jap. name: Chichijima-kuroki

Chrom. numb. 2n = 22.

Habitat. Subtropical dry evergreen forests.

Distr. Japan (Bonin: Chichi-jima Is.), endemic.



Map 17. Distribution of *Symplocos pergracilis* (Nakai) Yamazaki (disk) and *S. boninensis* Rehder & Wilson (triangle).

JAPAN. **Bonin**. Chichi-jima Is.: Takeda-bokujo, *H. Toyoshima* (TI), *T. Nakai* (TI), *T. Tuyama* (TI); Mt. Chuozan, *M. Okabe TNS58203* (TNS), 300 m, *T. Yamazaki & K. Enomoto 137* (KYO, TI), *G. Murata et al. 251, 258* (KYO, TI), *T. Toyoda* (TI); Chuoosan-higashidaira, 200–250 m, *Y. Shimizu 77-85, 77-132, 79-22, 79-70, 80-110* (KYO), *T. Shimizu 84-1835* (KYO); Higashidaira, *K. Inoue 1457* (TI), *M. Ito et al. 257907, 257908* (KYO, MAK); Mt. Yoake–Mt. Chuo, *Y. Momiyama et al. 125983* (KYO, MAK, TI), 250–300 m, *M. Ono & S. Kobayashi 123692* (MAK, TI); Chuozan to Hatuneyama, 200 m, *T. Yamazaki* (TI); Mt. Hatsune, *Y. Momiyama et al. 126134, 126135* (KYO, MAK, TI).

Notes. 1. Recently, Shimizu & Yasui (1992) reported this endangered species also from Anijima Is., adjacent to Chichijima Is.

2. See Nagamasu (1987) for a detailed distribution map.

20. **Symplocos boninensis** Rehder & Wilson—Fig. 3-20 & 4a, Map 17, Plate 66d.

S. boninensis Rehder & Wilson, J. Arn. Arb. 1: 119 (1919), *excl. pl. ex Ins. Chichijima.*; Makino & Nemoto, Fl. Jap. ed. 2: 918 (1931); Nooteboom, Leid. Bot. Ser. 1: 133 (1975), *excl. syn. Bobua pergracilis*; Toyoda, Fl. Bonin Is.: 154, photo 69, t. 69 (1981); Nagamasu, Acta Phytotax. Geobot. 38: 287 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 190-5 (1989). —*Dicalix boninensis* Hara, Enum. Sperm. Jap. 1: 104 (1948).—Type: *E.H. Wilson 8336* (A! Plate 66d, isotypes in BM, E!, K!), Mukoh-jima, Bonin Isls.

Small evergreen trees. Twigs green or brown, terete; young twigs green, glabrous, ridged below petioles. Terminal buds subulate, apex usually curved, glabrous, 8–15 mm long. *Leaves*: blades coriaceous, elliptic, 6–9 cm long, 2.5–5 cm wide; apex obtuse to rounded; base attenuate; margin recurved, entire or slightly glandular-crenate with teeth 5–10 mm apart; both surfaces glabrous; midrib slightly elevated on upper surface, prominent on lower surface; nerves 5–8 pairs, slightly prominent on both surfaces; petioles glabrous, narrowly winged, often tinged violet, 8–30 mm long. *Inflorescence* axillary, a reduced contracted spike, branched at base, to 1 cm long, 1 to 3-flowered; axis with many persistent sterile bracts; bracts widely ovate, rounded at apex, glabrous except for ciliolate margin, 1.5–3.5 mm long. *Flowers*: calyx tube glabrous, about 1 mm high; calyx limb 3–3.5 mm long; calyx lobes imbricate, widely ovate, rounded at apex, glabrous, 3–3.5 mm long, margin ciliolate; corolla white, 5–6 mm long, deeply 5-lobed, the lobes elliptic, ciliolate; corolla tube about 1 mm long; stamens 60–100, pentadelphous; disk pulvinate, with 5 glands, soft pilose; style sparsely pilose, about 6 mm long; ovary 3-locular. *Fruits* 3-locular, (obliquely) obovoid to narrowly obovoid, (16–)20–25 mm long, (8–)10–13 mm in diameter, persistent calyx lobes bending inwards; stones trigonous with shallow lengthwise grooves, base acute; mesocarp and endocarp woody; seeds 1–2 in each locule, straight, with straight embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum verrucate or gemmate, globulate; globules loosely attached to tectum, striately sculptured; ora transversely elliptic; 23.5 μm (P) × 28.6 μm (E); pollen type IIb. —Flowers: Oct. Fruits: July (Toyoda, 1981).

Jap. name: Munin-kuroki

Chrom. numb. 2n = 22.

Habitat. Subtropical dry evergreen forests.

Distr. Japan (Bonin: Mukoh-jima Is.), endemic.

JAPAN. **Bonin**. Haha-jima Group, Mukoh-jima Is.: *M. Okabe 59162* (TNS), *Y. Satake 91356* (TNS), *H. Hara* (TI), *T. Tuyama* (TI), *Murata et al. 646* (KYO), *M. Ito et al. 257874, 257875* (KYO, MAK), *H. Kihara* (KYO); 50–100 m, *E.H. Wilson 8336* (A, E, K), *H. Tabata & Y. Shimizu 79-51, 79-55* (KYO).

Note. See Nagamasu (1987) for a detailed distribution map.

21. **Symplocos tanakae** Matsumura—Fig. 3-21 & 4b, Map 18, Plate 67a.

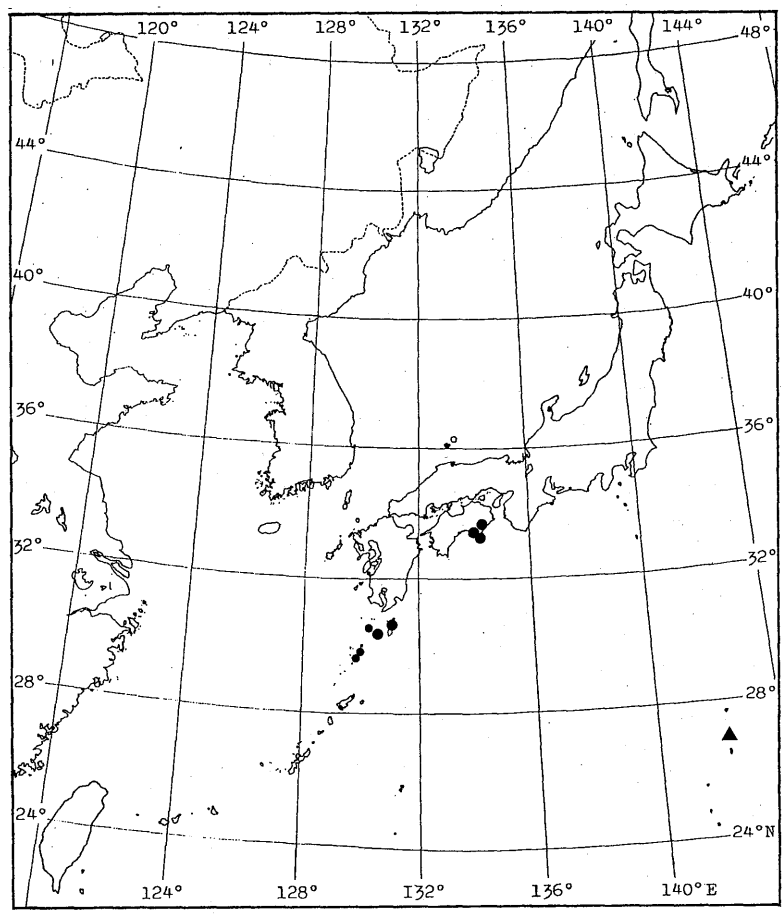
S. tanakae Matsumura, Bot. Mag. Tokyo 15: 79 (1901); Ind. Pl. Jap. 2(2): 488 (1912); Ohwi, Fl. Jap.:

933 (1953); Kitamura & Murata, Wood. Pl. Jap. 1: 99, t. 119 (1971); Nagamasu, Acta Phytotax. Geobot. 38: 290 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 172, pl. 179-3 (1989). —*Bobua tanakae* Masamune, Prel. Rep. Veg. Yakus.: 110 (1929); Fl. Geo. Yakus.: 365 (1934). —*Dicalix tanakae* Hara, Enum. Sperm. Jap. 1: 107 (1948). —Type: *S. Tanaka 436* (TI!, Plate 67a), Ins. Tanegashima, Japan.

S. zentaroana Makino *ex* Yanagida, J. Jap. Forestry Soc. 20(3): 115, no. 532, fig. 531 (1938), *nom. nud., descr. in jap.*

S. lucida auct. *non* Sieb. & Zucc.: Nooteboom, Leid. Bot. Ser. 1: 217 (1975).

Evergreen trees. Twigs green or ashy brown, terete; young twigs green, grabrous, obtusely ridged below petioles. Terminal buds narrowly ovoid to subulate, glabrous, apex acute or acuminate, often slightly curved, 7–14 mm long. *Leaves*: blades coriaceous, narrowly obovate to narrowly oblong-elliptic, 7–13 cm long, 2–3.5(–4) cm wide; apex obtuse, acute or short acuminate; base attenuate; margin recurved, glandular-crenate with teeth 3–10 mm apart, usually the proximal half entire; both surfaces glabrous; midrib slightly promi-



Map 18. Distribution of *Symplocos tanakae* Matsumura (disk) and *S. kawakamii* Hayata (triangle). Small disks are based on the literature.

nent to slightly sulcate on upper surface, prominent on lower surface; nerves 8–14 pairs, slightly prominent on both surfaces; reticulation obscure; petiole glabrous, narrowly winged, 10–25 mm long. *Inflorescence* axillary, a contracted spike, to 1 cm long, 5 to 8-flowered, bracts persistent, orbicular to widely ovate, often split, apex rounded, glabrous, 4–5 mm long, margin ciliolate; bracteoles 2, persistent, elliptic to (obliquely) ovate, keeled, apex acute or rounded, 3.5–4.5 mm long, keel glabrous or sparsely pilose, margin ciliolate. *Flowers*: calyx tube glabrous, about 1.5 mm high; calyx limb glabrous, 3.5–4 mm long; calyx lobes imbricate, widely ovate to elliptic, apex rounded, glabrous, 3.5–4 mm long, margin ciliolate; corolla white, 6–7.5 mm long, deeply 5-lobed, the lobes elliptic; corolla tube about 1 mm long; stamens 60–75, pentadelphous; disk pulvinate, with 5 glands, soft pilose; style glabrous, 7–7.5 mm long; ovary 3-locular with 4 ovules in each locule. *Fruits* 3-locular, globose to ellipsoid, 18–25 mm long, 15–20 mm in diameter, crowned by persistent calyx lobes; stones ellipsoid, smooth or with longitudinal shallow grooves; mesocarp and endocarp woody; seeds 1–2 in each locule, U-shaped to slightly curved with similarly curved embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum verrucate and/or gemmate; ora transversely elliptic; 22.1 μm (P) × 26.7–27.3 μm (E); pollen type IIb. —Flowers: Oct.–Jan. Fruits: Sept.–Dec.

Jap. name: Oni-kuroki, *Hiroha-no-mimizubai*

Chrom. numb. 2n = 22.

Habitat. Warm temperate (montane) evergreen forests.

Distr. Japan (Shikoku, Kyushu), endemic.

JAPAN. **Shikoku**. Tokushima: Kushikawa, Kaifu-cho, Kaifu-gun, *T. Nakayama 438* (TOFO); 20–40 m, *H. Nagamasu & A. Soejima 4589* (KYO). —Kochi: *T. Makino MAK197815* (MAK, RYU); Gyodo-misaki, Muroto-cho, *T. Yoshinaga* (KYO); Kongouchou-ji Temple, 160–200 m, Muroto-shi, *H. Nagamasu & A. Soejima 4588* (KYO); Kitayama-son, Sasayani-yama, *Anonymous* (KYO); Nahari-son, Sukawa-dake, *G. Koidzumi* (KYO); Kitagawa-mura, Aki-gun, *T. Yamawaki 84* (TI). **Kyushu**. Kagoshima. Tanega-shima Is.: Nishinoomote, *S. Tanaka 436* (TI); Eboshi-dake, *Z. Tashiro* (KYO). Yaku-shima Is.: *G. Koidzumi* (KYO, TI), *G. Masamune* (TI), *Koyama* (TI); Koyoji-rindo, 100–500 m, *S. Amano et al. 260* (KYO, TI); Koyoji River, 350 m, *S. Mitsuta et al. 558* (KYO), 1050–1250 m, *J. Murata et al. 15931* (TI), Migi-tani, 1050–1150 m, *G. Murata et al. M-7* (KYO, TI); Ambo to Kosugi-dani, *Z. Tashiro* (KYO); near Hanayama, *S. Sako 6484* (KYO); Kurio to Hanayama, 700 m, *S. Sako 6484* (KYO); Hanayama reserved forest, 1020–1280 m, *G. Murata et al. 505* (KYO, TI), *S. Mitsuta & H. Doei 488, 796* (KYO); Hanayama trail, 850–950 m, *S. Mitsuta & H. Doei 248* (KYO); Segire River, 550 m, *S. Mitsuta & H. Nagamasu 108* (KYO); Kuromi trail, 1000–1100 m, *S. Mitsuta et al. 289, 305* (KYO, TI); Kuniwari-dake, *S. Okamoto* (KYO), 300 m, *T. Yamazaki 6880, 6946* (TI); Kusukawa path, 200–600 m, *J. Murata et al. 15455* (KYO, TI); Kusukawa–Kosugidani, *Y. Doi* (TI); Yudomari, 600 m, *T. Yamazaki 6176* (TI).

Note. This species is also known from Tokara Isls.: Kuchinoerabu Is., Nakanoshima Is. and Suwanosejima Is. (Hatusima, 1986).

22. **Symplocos kawakamii** Hayata —Fig. 3-22, Map 18, Plate 67b–c.

S. kawakamii Hayata, Icon. Pl. Form. 5: 104, t. 30 (1915); Makino & Nemoto, Fl. Jap.: 372 (1925); Toyoda, Fl. Bonin Is.: 175, photo 80, t. 80 (1981); Nagamasu, Acta Phytotax. Geobot. 38: 287 (1987); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 104, pl. 188-3 (1989). — *Bobua kawakimii* Nakai, [Rigakkai 26(5): 7 (1928), *nomen, non vidi*] Bot. Mag. Tokyo 44: 24 (1930); Nemoto, Fl. Jap. Suppl.: 581 (1936). — *Dicalix kawakamii* Hara, Enum. Sperm. Jap. 1: 104 (1948). —

Type: *T. Kawakami* (TI!, Plate 67b), Bonin Isls.

S. otomoi Rehder & Wilson, J. Arn. Arb. 1: 119 (1919). — Type: *H. Otomo* (A!, Plate 67c), Chichi-jima, Bonin Isls.

Evergreen shrubs. Twigs green or ashy brown, conspicuously ridged; young twigs green, glabrous, conspicuously ridged below petioles. Teminal buds ovoid, apex acute, glabrous, with keeled scales, 3–5 mm long. *Leaves*: blades coriaceous, obovate, elliptic or ovate, 2–5 cm long, 0.7–2 cm wide; apex retuse or rounded; base attenuate; margin conspicuously recurved, nearly revolute, entire; both surfaces glabrous; midrib prominent near base, impressed distally on upper surface, prominent on lower surface, usually ridged near base on lower surface; nerves 5–7 pairs, impressed on upper surface with reticulation (rugose on upper surface), obscure on lower surface; petiole glabrous, winged, abaxially ridged, 2–8 mm long. *Inflorescence* axillary spike branched near base, 0.5–2.5(–3) cm long, 3 to 10-flowered; axis ridged, sparsely pilose, nearly glabrous; bracts persistent, narrowly ovate to ovate, 2–4 mm long, apex rounded, obtuse or acute, glabrous, margin ciliolate; bracteoles 2, persistent, ovate to triangular, keeled, 2.5–3 mm long, glabrous, margin ciliolate. *Flowers*: calyx tube glabrous, about 1.5 mm high; calyx limb 2.5–3 mm long; calyx lobes imbricate, ovate, rounded or obtuse at apex, margin ciliolate, 2.5–3 mm long; corolla white, about 7 mm long, deeply 5-lobed, the lobes elliptic, ciliolate; corolla tube about 1 mm long; stamens 70–90 (1 specimen examined), pentadelphous; disk flat to slightly pulvinate, with 5 glands, soft pilose; style glabrous, 3.5–4 mm long; ovary 3-locular with 4 ovules in each locule. *Fruits* 3-locular, globose or (obliquely) obovoid, 14–20 mm long, 10–12 mm in diameter, persistent calyx lobes forming a blunt beak; stones obovoid, smooth, 7–8 mm in diameter; mesocarp and endocarp woody; seeds 1–2 in each locule, straight or slightly curved, with straight or slightly curved embryo. *Pollen grains* 3-colporate, brevicolpate, semiangular in polar view, suboblate in equatorial view; tectum gemmate and globulate; globules striately sculptured; ora transversely elliptic; 23.2 μm (P) × 28.8 μm (E); pollen type IIb. — Flowers: Nov. Fruits: Oct. (Toyoda, 1981).

Jap. name: Uchidashi-kuroki

Habitat. Subtropical dry scrubs.

Distr. Japan (Bonin: Chichi-jima Is.), endemic.

JAPAN. **Bonin**. Chichi-jima Is.: *H. Otomo* (A), *T. Kawakami* (TI), *G. Oka* (KYO); Takeda bokujo, *S. Nishimura 574* (TI), *s. n.* (KYO), *T. Nakai* (TI) *T. Tuyama* (TI), *M. Okabe* (TI); Chuozan (Takedabokujo), *H. Toyoshima* (TI); Hatsune-yama, *Toyoda* (TI), *M. Ono & S. Kobayashi 127498* (MAK, TI); south peak of Mt. Hatsune, *Y. Momiyama et al. 126315* (KYO, MAK); Hatsuneyama-Ohtaki, 200 m, *T. Yamnazaki* (TI); Hatsuneura, *G. Murata et al. 82, 110* (KYO); along Hatsuneura yuhodo, 180–210 m, *Y. Shimizu 77-47* (KYO); Mt. Yoake–Chuosan-higashidaira, 230–260 m, *Y. Shimizu 80-52* (KYO); Yoakedaira to Nagahama, 100 m, *T. Yamazaki* (TI).

Note. See Nagamasu (1987) for a detailed distribution map.

Sect. 8. **Okinawenses** Nagamasu

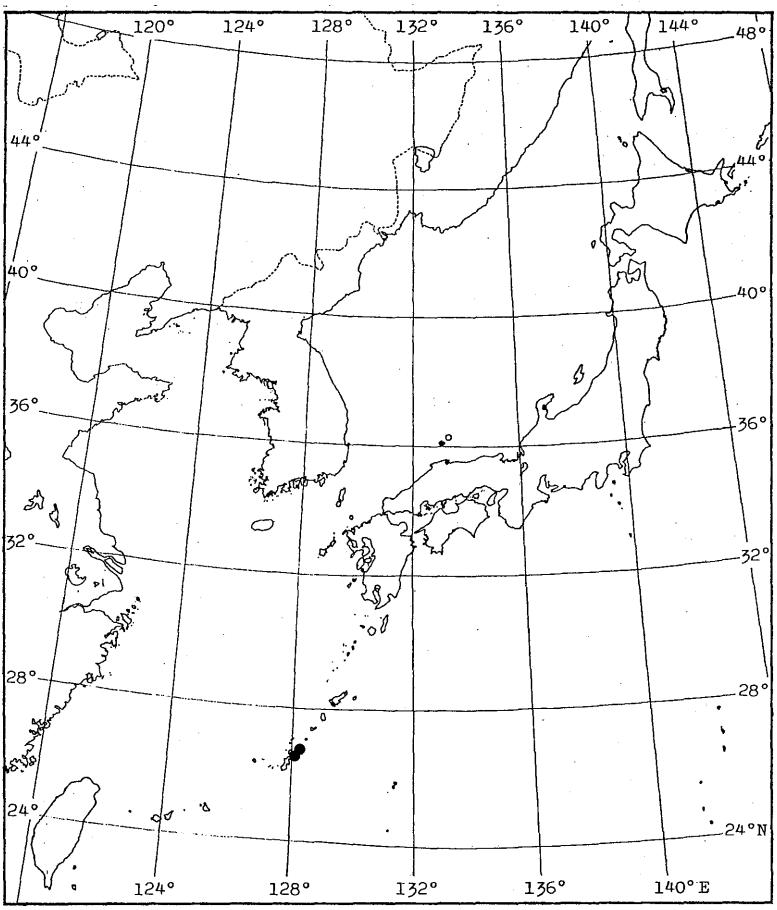
23. **Symplocos okinawensis** Matsumura — Fig. 3-23 & 4d, Map 19, Plate 67d.

S. okinawensis Matsumura, Bot. Mag. Tokyo 15: 78 (1901); Ind. Pl. Jap. 2(2): 488 (1912); Walker,

Imp. Tr. Ryukyu Is.: 265 (1954), *excl. descr. et t. 170*; Hatusima, Fl. Ryukyus: 476 (1971), *excl. syn.*; Walker, Fl. Okinawa South. Ryukyu Is.: 833 (1976); Murata in Satake et al., Wild Fl. Jap. Wood. Pl. 2: 174, pl. 193-1 (1989); Shimabuku, Check List Ryukyu Is.: 353 (1990). — *Bobua okinawensis* Nemoto, Fl. Jap. Suppl.: 583 (1936). — Type: *Matsumura* (TI!, Plate 67d), Onnah, Okinawa Is., Ryukyus.

S. anomala auct. *non* Brand: Nooteboom, Leid. Bot. Ser. 1: 126 (1975).

Small evergreen trees. Twigs brown, terete; young twigs rusty or red-brown, tomentellous to appressedly pubescent, slightly ridged below petioles. Terminal buds obliquely ovoid or subulate, appressedly pubescent, apex acute or acuminate and usually curved, 2–5 mm long. *Leaves*: blades coriaceous, elliptic, 4–6 cm long, 1.5–2.5 cm wide; apex acute to acuminate with apiculate tip; base attenuate; margin slightly recurved, crenate-serrate, with teeth 1.5–5 mm apart; both surfaces glabrous, or rarely young leaves appressed hairy; upper surface shining; midrib prominent on both surfaces; nerves 5–7 pairs, slightly prominent on both surfaces; petioles narrowly winged, glabrous, 2–5 mm long. *Inflorescence* an axillary



Map 19. Distribution of *Symplocos okinawensis* Matsumura.

raceme, rarely branched at base, loosely 3 to 7-flowered, to 1 cm long; pedicels 1–4 mm long; the axis and pedicels silverly tomentellous or appressed pubescent; bracts ovate to narrowly ovate, 0.5–1.5 mm long, apex acute; bracteoles 2, ovate to narrowly ovate, 0.5–1.5 mm long, apex acute; both persistent, inside glabrous, outside with same indument as axis. *Flowers*: calyx with same indument as inflorescence axis; calyx tube 1–1.5 mm high; calyx limb 1–1.5 mm long; calyx lobes imbricate, semi-orbicular, the apex rounded, margin ciliate, 0.7–1 mm long; corolla white, 4–6 mm long, deeply 5-lobed, the lobes elliptic; corolla tube about 1 mm long; stamens pentadelphous, 50–100; disk short cylindrical, tomentose; style glabrous, 5–7 mm long; ovary 3-locular, with 4 ovules in each locule. *Fruits* ellipsoid, 3-locular, 7–9 mm long, 4–5 mm in diameter, excluding the persistent calyx lobes; stones ellipsoidal, longitudinally shallowly grooved; mesocarp thin; endocarp woody; seeds 1 in each locule, straight with straight embryo. *Pollen grains* 3-colporate, brevicolpate, subangular to semilobate in polar view, oblate in equatorial view; tectum corrugate and partly verrucate; ora transversely elliptic; 19.9 μm (P) × 29.8 μm (E); pollen type IIc. —Flowers: Aug.–Dec. Fruits: next summer?

Jap. name: Ryukyu-hainoki

Habitat. Subtropical montane evergreen forests.

Distr. Japan (Ryukyu: Okinawa Is.), endemic.

JAPAN. **Ryukyu**. Okinawa Is.: Mt. Nishime-dake, 200–300 m, *G. Murata et al. 56784, 56791* (KYO); from Hentona to Yonaha-dake, *Y. Kimura & I. Hurusawa* (TI); Mt. Yonaha, *Y. Niiro 941* (RYU), *T. Kinjo 184* (KYO), *Z. Tashiro* (KYO), 300–400 m, *H. Kanai et al. 732608* (KYO, TI, TNS), *T. Yamazaki 1958* (RYU, TI); Mt. Yona, 300 m, *S. Hatusima 18222* (RYU, TI); Mt. Iyu-dake, *Y. Miyagi & S. Hatusima 37196* (RYU); Sade, *S. Sonohara* (KYO); Onishimori, *S. Sonohara* (KYO), *G. Koidzumi* (KYO); Genka, *T. Miyagi* (KYO), *S. Sakaguchi* (KYO); Benoki-gawa, *Z. Tashiro* (KYO); Hentona-san, *S. Tawada 279* (KYO); Mt. Ibu-dake, *Z. Tashiro* (KYO); Mt. Tano-dake, *Y. Niiro 3379* (RYU); Mt. Tanyu-dake, *S. Sonohara et al. 6307* (TI), *S. Hatusima 813* (RYU); Meiji-yama, Nago, *S. Sonohara 7042* (RYU); Onnah, *J. Matsumura* (TI); Nakagami, *G. Koidzumi* (KYO).

Note. This species is closely related to *S. morrisonicola* Hayata of Taiwan, but the latter differs in its longer calyx limb and lobes, the valvate calyx lobes and fewer 25–40 stamens.

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College of Science, National Taiwan University, Taipei (TAI).
Botanical Gardens, University of Tokyo, Tokyo (TI).
National Science Museum, Tokyo (TNS).
University Museum, University of Tokyo, Tokyo (TOFO).
Faculty of Science, Tohoku University, Sendai (TUS).
Botanical Museum, Uppsala University, Uppsala (U).
University of California, Berkeley (UC).
Naturhistorisches Museum Wien, Wien (W).
Faculty of Science, Shizuoka University, Shizuoka, Japan.

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APPENDIX 1

Artificial Key to the Species in Japan

1a. Deciduous trees or shrubs; inflorescences terminal panicles.
  2a. Bark transversely fissured; leaves ovate to elliptic, glaucous on lower surface; fruits black. ..... 5. *S. tanakana*
  2b. Bark longitudinally fissured or exfoliating; leaves obovate, elliptic, oblong, or ovate, lower surface pale green but not glaucous; fruits blue, dark blue, or black.
    3a. Lower surface of leaves finely reticulate, often tinged red and distinctly visible, but not prominent on lower surface; fruits black. ..... 4. *S. paniculata*
    3b. Lower surface of leaves coarsely reticulate, veins more or less prominent; fruits dark blue or blue.
      4a. Leaves ovate to obovate, apex acuminate to caudate, margin coarsely glandular dentate; panicles without foliage leaves; fruits dark blue. ..... 2. *S. coreana*
      4b. Leaves obovate to elliptic, apex abruptly acute to acuminate, margin serrulate; panicles with a few foliage leaves; fruits blue. ..... 3. *S. sawafutagi*
1a. Evergreen trees or shrubs; inflorescences axillary.
  5a. Bracts caducous; inflorescence a raceme.
    6a. Young twigs green.
      7a. Pedicels 1–8(–12) mm long; inflorescences 5 to 12(–17)-flowered; ora of pollen grains not prominent. ..... 7. *S. liukiuensis*
      7b. Pedicels slender, 8–15 mm long; inflorescences loosely 3 to 6-flowered; ora of pollen grains prominent. ..... 6. *S. myrtacea*
    6b. Young twigs grey or brown.
      8a. Young twigs brown, pilose to glabrescent; inflorescences 5 to 10-flowered; ora of pollen grains prominent; fruits ampulliform to ovoid; seeds curved. ..... 8. *S. caudata*
      8b. Young twigs grey, glabrous; inflorescences rather densely 10 to 30-flowered; ora of pollen grains not prominent; fruits narrowly ellipsoid; seeds straight. ..... 9. *S. prunifolia*
  5b. Bracts persistent; inflorescences racemose, spicate, or 1-flowered.
    9a. Young twigs brown or dark brown, more or less hairy.
      10a. Inflorescences racemes (flowers distinctly pedicellate).
        11a. Leaves brown to dark brown when dry; midrib impressed on upper surface; corolla tube 2–3 mm long; stamens modadelphous; ovary 2-locular. ..... 1. *S. sonoharae*
        11b. Leaves not brown when dry; midrib prominent on upper surface; corolla tube ca. 1 mm long; stamens pentadelphous; ovary 3-locular. ..... 23. *S. okinawensis*
      10b. Inflorescences simple or compound spikes (flowers sessile or rarely shortly pedicellate); elongate or condensed in head-like clusters.
        12a. Inflorescences elongate spikes.
          13a. Twigs thick; spikes usually branched near the base; stones ampulliform; seeds twice curved.
            14a. Leaves 14–25 cm long; nerves distinctly prominent on lower surface; calyx lobes 1.5–2(–2.5) mm long, forming a beak on top of fruit. ..... 11. *S. cochinchinensis*
            14b. Leaves 7–15 cm long; nerves slightly prominent on lower surface; calyx lobes 0.5–1 mm long, not forming a beak on top of fruit. ..... 12. *S. theophrastifolia*
          13b. Twigs slender; spikes simple; stones ovoid to obovoid; seeds once curved.
            15a. Bracts 1–2 mm long; disk glabrous; fruits 4–6 mm long; flowering in autumn. ..... 13. *S. lancifolia*
            15b. Bracts 0.7–1 mm long; disk pilose; fruits 3–4 mm long; flowering in spring. ..... 14. *S. microcalyx*
        12b. Inflorescences condensed in head-like clusters.
          16a. Leaves coriaceous, papillate on lower surface; corolla 4–4.5 mm long, the lobes spreading; disk annular, shortly cylindrical or pulvinate; stones longitudinally slightly grooved or rather smooth. ..... 15. *S. glauca*
          16b. Leaves thick coriaceous, not papillate on lower surface; corolla 7–9 mm long, the lobes not spreading; disk cylindrical; stones with 10 longitudinal grooves. ..... 16. *S. stellaris*

9b. Young twigs green, glabrous.
17a. Twigs conspicuously ridged, nearly winged; leaves revolute, upper surface rugose. ..... 22. *S. kawakamii*
17b. Twigs more or less ridged; leaves (slightly) recurved, upper surface not rugose.
18a. Terminal buds hairy; inflorescences more than 2.5 cm long; disk glabrous; seeds twice curved. ..... 10. *S. konishii*
18b. Terminal buds glabrous; inflorescences less than 2 cm long; disk hairy; seeds straight to U-shaped.
19a. Inflorescences 1 to 3-flowered.
20a. Twigs thick, not zigzag; blades 6–9 cm long; inflorescences 1 to 3-flowered; calyx lobes of fruit bending inward, forming a blunt beak. ..... 20. *S. boninensis*
20b. Twigs slender, often zigzag; blades 3–6 cm long; inflorescences 1(–2)-flowered; calyx lobes of fruit erect or spreading, forming a crown. ..... 19. *S. pergracilis*
19b. Inflorescences more than 5-flowered.
21a. Blades 7–13 cm long; stamens more than 50 in number; ovary 3-locular; fruits globose to ellipsoid, 15–20 mm in diameter. ..... 21. *S. tanakae*
21b. Blades 4–7 cm long; stamens 20–40 in number; ovary usually 2-locular; fruits ellipsoid, 5–9 mm in diameter.
22a. Bracteoles 1.5–2 mm long; corolla 3.5–4 mm long; fruits 6–10 mm excluding persistent calyx lobes. ..... 17. *S. nakaharae*
22b. Bracteoles 2–3 mm long; corolla (3.5–)4–5 mm long; fruits 9–13 mm long excluding persistent calyx lobes. ..... 18. *S. kuroki*

APPENDIX 2

Index to Taxa

The numbers proceeded by 'p.' indicate the page numbers. All specific and intraspecific Latin names are referred to the number of the taxon to which they belong. Accepted names for Japanese species are printed in bold type, synonyms and other taxa are in italics.

LEGEND FOR PLATES

Plate 53

a. *Symplocos sonoharae* Koidz.: Lectotype of *S. sonoharae*, Benoki-gawa, Okinawa Is., *Sonohara 1* (KYO). — b – c. *S. coreana* (Lév.) Ohwi. b: Holotype of *Cotoneaster coreanus* Lév., Hallaisan, Jeju-do, Korea, *Taquet 1106* (E). c: Lectotype of *S. argutidens* Nakai, Jeju-do, Korea, *Nakai 6408* (TI). — d. *S. sawafutagi* Nagamasu: Lectotype of *Palura paniculata* var. *pilosa* Nakai, 11 May 1878, Shirako, Japan, *Anonymous* (TI).

Plate 54

a. *Symplocos sawafutagi* Nagamasu: Holotype of *S. paniculata* var. *leucocarpa* Nakai, Changzen, E Korea, *Nakai 6074* (TI). — b – d. *S. paniculata* (Thunb. *ex* Murray) Miq. b: Holotype of *S. paniculata* var. *glabrifolia* Miq., Mt. Hiruyama, Figo, *Keiske* (L). c: Holotype of *S. paniculata* var. *parvifolia* Miq., Japan, *Keiske* (L). d: Isotype of *S. crataegoides* var. *pallida* Franch. & Sav., Japan, *Savatier 2908* (P).

Plate 55

a. *Symplocos paniculata* (Thunb. *ex* Murray) Miq.: Lectotype of *S. paniculata* var. *glabra* Makino, Kamikano-mura, Mino, Japan, *K. Mori* (MAK). — b – c. *S. tanakana* Nakai. b: Lectotype of *S. tanakana* Nakai, Jeju-do, Korea, *Nakai 6411* (TI). c: Lectotype of *S. paniculata* var. *pubescence* Nakai, Jeju-do, Korea, *Nakai 1359* (TI). — d. *S. myrtacea* Sieb. & Zucc. var. *myrtacea*: Isotype of *S. myrtacea*, Japan, *von Siebold* (L).

Plate 56

a. *Symplocos myrtacea* Sieb. & Zucc. var. *myrtacea*: Holotype of *S. myrtacea* var. *pubescens* Uyeki & Tokui, Omogo-kei, Iyo, Shikoku, Japan, *O. Tokui* (MATSU). — b. *S. myrtacea* Sieb. & Zucc. var. *latifolia* Hatusima: Mt. Yokodake, Kuroshima Is., *S. Sako 599* (KYO). — c – d. *S. liukiuensis* Matsumura var. *liukiuensis*. c: Holotype of *S. liukiuensis*, Okinawa Is., *Y. Tashiro* (TI). d: Isotype of *S. obana* Masamune, Tina, Okinoerabu Is., Ryukyu, *H. Ohba 12* (KYO).

Plate 57

a. *Symplocos liukiuensis* Matsumura var. *iriomotensis* Nagamasu: Holotype, Iriomote Is., Ryukyu, *Mitsuta & Nagamasu 435* (KYO). — b – d. *Symplocos caudata* Wall. *ex* G. Don. b: Isotype of *S. caudata*, Sylhet, India, *Wallich 4413* (BM). c: Holotype of *S. swinhoeana* Hance, Fu Kien, China, *de Grijs in Herb. Hance 6697* (BM). d: Lectotype of *S. caudata* var. *maculata* Brand, Mt. Kushan, Futschau, S China, *Warburg 5851* (K).

Plate 58

a – d. *Symplocos caudata* Wall. *ex* G. Don. a: Holotype of *S. somai* Hayata, Dec. 1915, Daikwakei, Toyencho, Taiwan, *T. Soma* (TI). b: Holotype of *S. sozanensis* Hayata, July 1918, Sozan, Taiwan, *Y. Shimada* (TI). c: 25 – 31 July 1923, Ishigaki Is., Ryukyu, *G. Koidzumi* (KYO). d: Isotype of *Bobua austrosinensis* Migo, near Kong Ts'eun, Kwangtung, China, *McClure CCC13164* (KYO).

Plate 59

a – c. *Symplocos prunifolia* Sieb. & Zucc. var. *prunifolia*. a: Isotype of *S. prunifolia*, Japan, *von Siebold* (L). b: Lectotype of *S. prunifolia* var. *paucistaminea* Gontscharow, N China, *Fortune 25* (BM). c: '*S. prunifolia* var. *uiae* Makino', Inari Prov., Kii, Japan, *N. Ui 9409* (TI). — d. *S. prunifolia* Sieb. & Zucc. var. *tawadae* Nagamasu: Holotype, Iriomote Is., Ryukyu, *Mitsuta & Nagamasu 424* (KYO).

Plate 60

a – b. *Symplocos konishii* Hayata. a: Holotype of *S. konishii*, in June 1907, Mts. Kusshaku, Taiwan, *Anonymous* (TI). b: Iriomote Is., Ryukyu, *Mitsuta & Nagamasu 545* (KYO). — c – d. *Symplocos cochinchinensis* (Lour.) Moore var. *cochinchinensis*. c: Holotype of *Dicalix cochinchinensis* Lour., Cochinchina, *Loureiro* (BM). d: Lectotype of *S. loha* Buch.-Ham. *ex* D. Don,

Narainhetty, Nepal, *Hamilton 'Symplocos? subspinosa'* (BM).

Plate 61

a–c. *Symplocos cochinchinensis* (Lour.) Moore var. *cochinchinensis*. a: Holotype of *Dicalix javanicus* Bl., Java, *Blume* (BO). b: Holotype of *S. ferruginea* Roxb., Assam, Garo Hills, *Roxburgh* (BM). c: Lectotype of *S. lithocarpoides* Nakai, 7 Dec. 1900, Higanakama, Amami-Oshima Is., Ryukyu, *T. Uchiyama* (TI). — d. *Symplocos cochinchinensis* var. *philippinensis* (Brand) Nooteboom: Lectotype? of *S. ferruginea* Roxb. var. *philippinensis* Brand, Mindanao, Philippines, *Ahern 4409* (BO, not 440?).

Plate 62

a. *Symplocos cochinchinensis* var. *philippineisis* (Brand) Nooteboom: Holotype of *S. kotoensis* Hayata, Kotosho (Lanyu Is.), Taiwan, *Kawakami & Sasaki* (TI). b–d. *Symplcos theophrastifolia* Sieb. & Zucc. b: Holotype of *S. theophrastaefolia*, Japan, *von Siebold* (L). c: Holotype of *S. stenostachys* Hayata, Goshizan, Shinchiku, Taiwan, *Kawakami 1438* (TI). — d. *S. lancifolia* Sieb. & Zucc.: Lectotype, Japan, *von Siebold* (L).

Plate 63

a–d. *Symplcos lancifolia* Sieb. & Zucc. a: Lectotype of *S. leptostachys* Sieb. & Zucc., Japan, *von Siebold* (L). b: Type of *S. microcarpa* Champ. *ex* Benth., Hongkong, *Champion* (K). c: Lectotype of *S. lancifolia* var. *cryptostachya* Miq., Japan, *Textor* (L). d: Lectotype of *S. lancifolia* var. *fulvipes* Clarke, Mont. Khasia, India, *Hook. f. & Thomson 50* (K).

Plate 64

a. *Symplocos microcalyx* Hayata: Holotype, Nago-dake, Okinawa Is., Ryukyu, *G. Nakahara* (TI). — b. *S. glauca* (Thunb.) Koidz.: Holotype of *S. neriifolia* Sieb. & Zucc., Japan, *Siebold* (L). — c–d. *S. stellaris* Brand. c: Holotype of *S. stellaris*, Setschwan, Nanchuan, China, *Bock & von Rosthorn 135* (W). d: Syntype of *S. tashiroi* Matsumura, Nago-dake, Kushi, Okinawa Is., Ryukyu, *S. Tanaka 179* (TI).

Plate 65

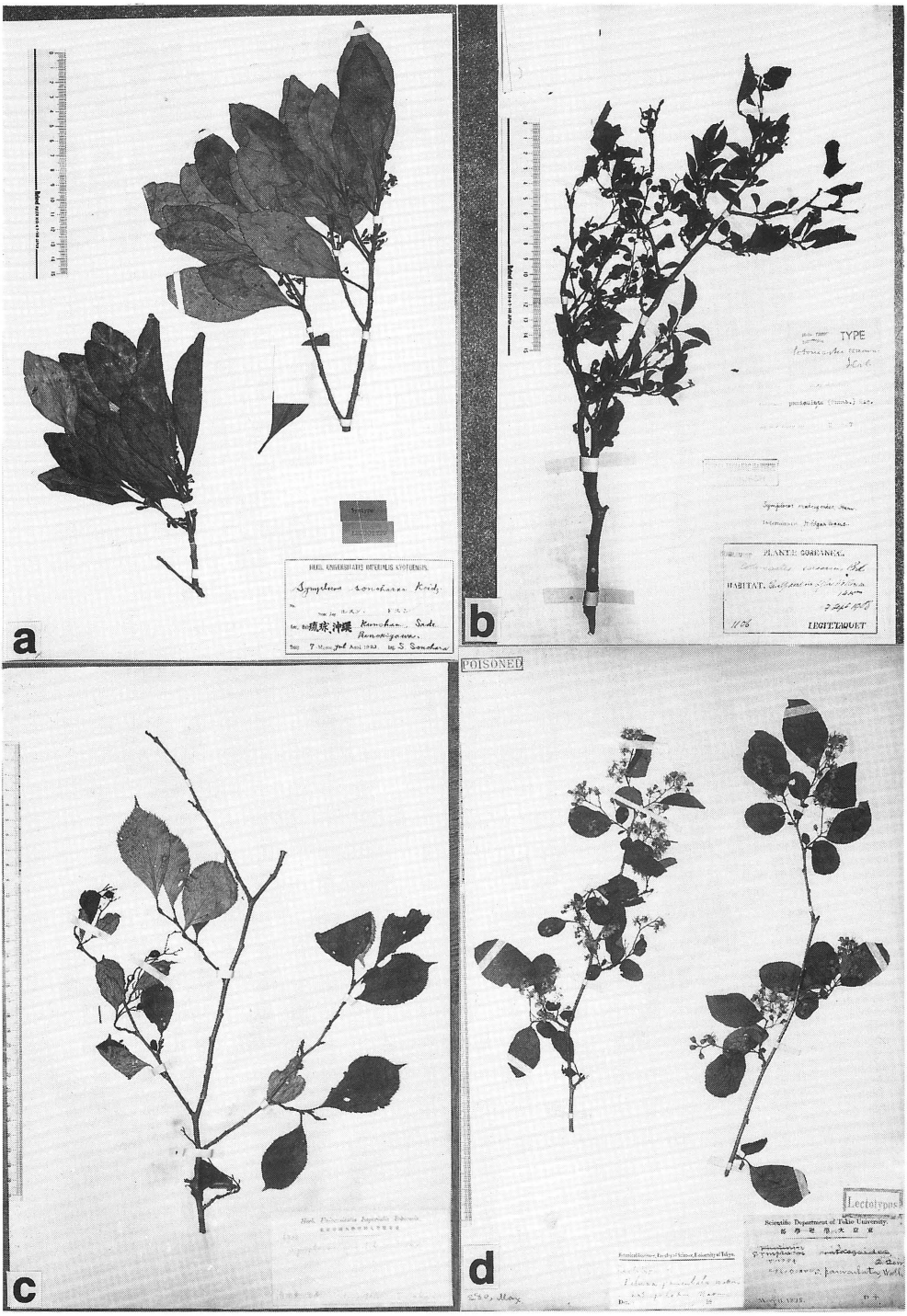
a–d. *Symplocos stellaris* Brand. a: Holotype of *S. wilsonii* Hemsley, Szechwan, China, *Wilson 4067* (K). b: Holotype of *S. dunniana* Lév., Kweichow, Pin fa, China, *Cavalerie 3016* (E). c: Holotype of *Litsea chaffanjonii* Lév., Kweichow, China, *Chaffanjon (Bodinier) 2244* (E). d: Type of *S. limprichtii* Winkler, Szechwan, Kwan Hsien, China, *Limpricht 1287* (K).

Plate 66

a. *Symplocos nakaharae* (Hayata) Masamune: Type of *S. japonica* DC. var. *nakaharae* Hayata, Nagotake, Okinawa Is., Ryukyu, *G. Nakahara* (TI). — b. *Symplocos kuroki* Nagamasu: Japan, *von Siebold* (L), noted as '*Myrtus laevis* Thunb., *Symplocos* or *Hoppea*'. — c. *S. pergracilis* (Nakai) Yamazaki: Holotype of *Bobua pergracilis* Nakai, Takeda-bokujo, Chichijima Is., Bonin Isls., *H. Toyoshima* (TI). — d. *S. boninensis* Rehder & Wilson: Holotype, Mukoh-jima, Bonin Isls., *E.H. Wilson 8336* (A).

Plate 67

a. *Symplocos tanakae* Matsumura: Holotype, Tanegashima Is., Japan, *S. Tanaka 436* (TI). — b–c. *S. kawakamii* Hayata. b: Holotype of *S. kawakamii*, Bonin Isls., *T. Kawakami* (TI). c: Holotype of *S. otomoi* Rehder & Wilson, Chichijima Is., Bonin Isls., *H. Otomo* (A). — d. *S. okinawensis* Matsumura: Holotype, Onnah, Okinawa Is., Ryukyu, *Matsumura* (TI).



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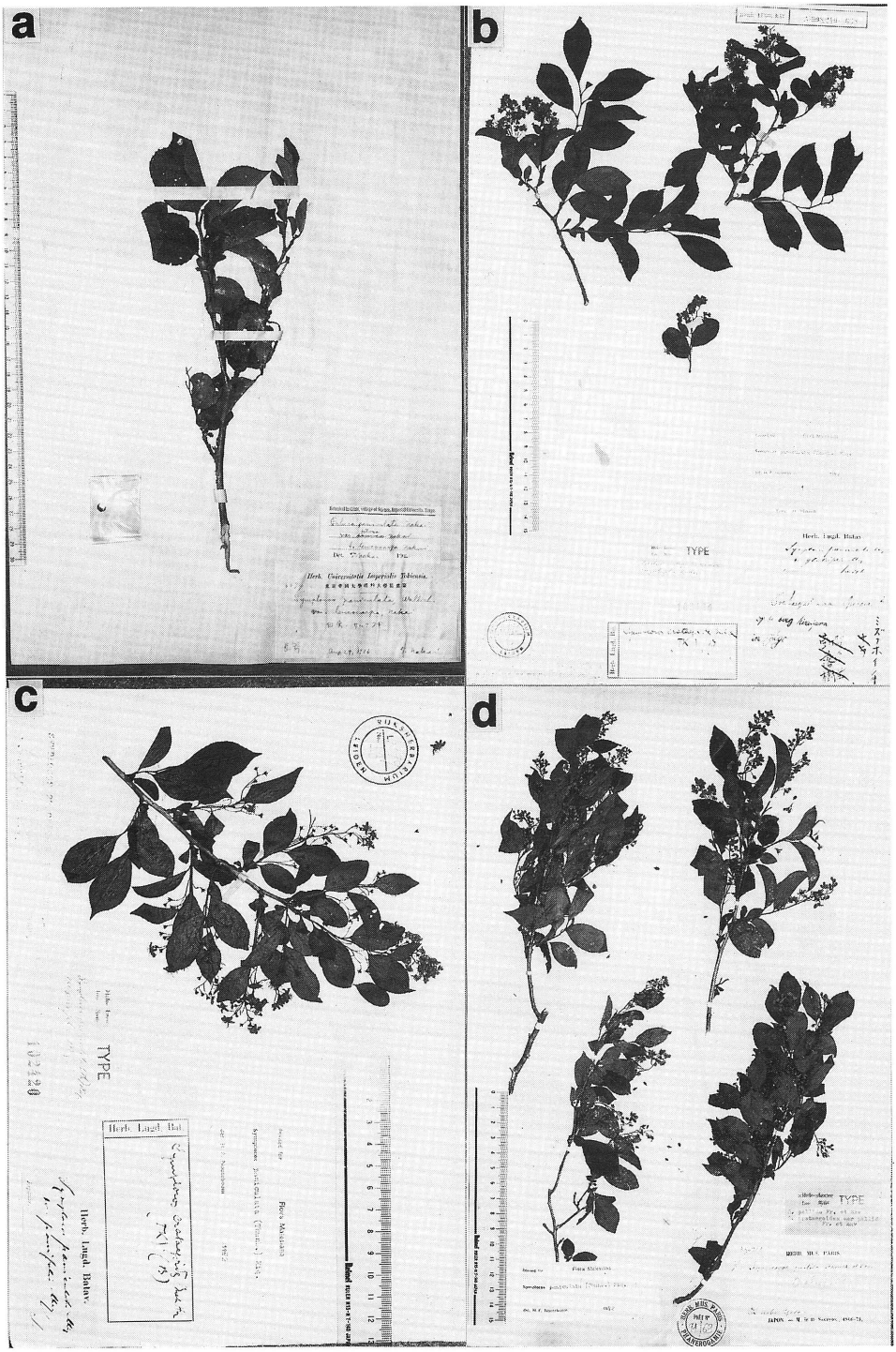

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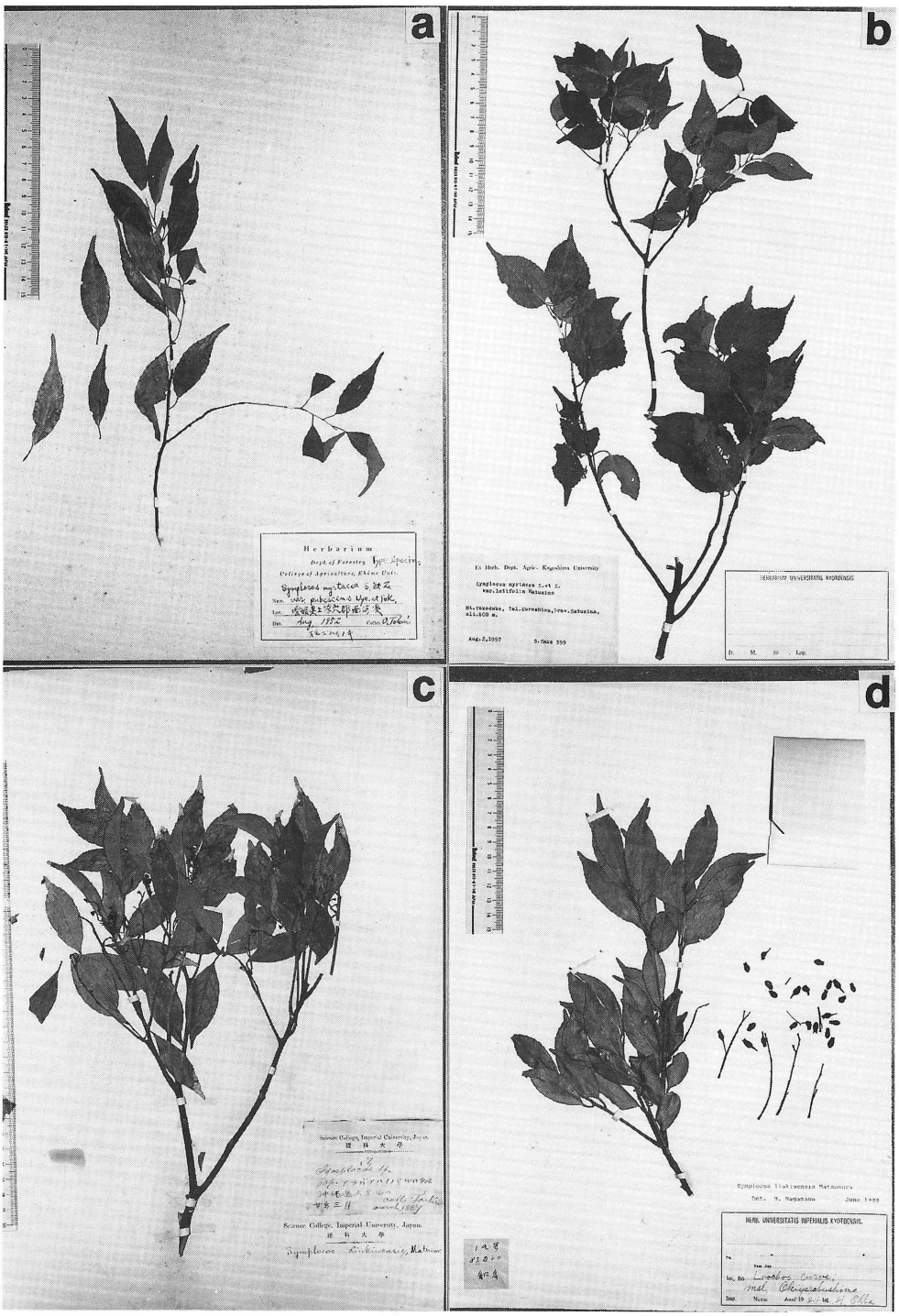

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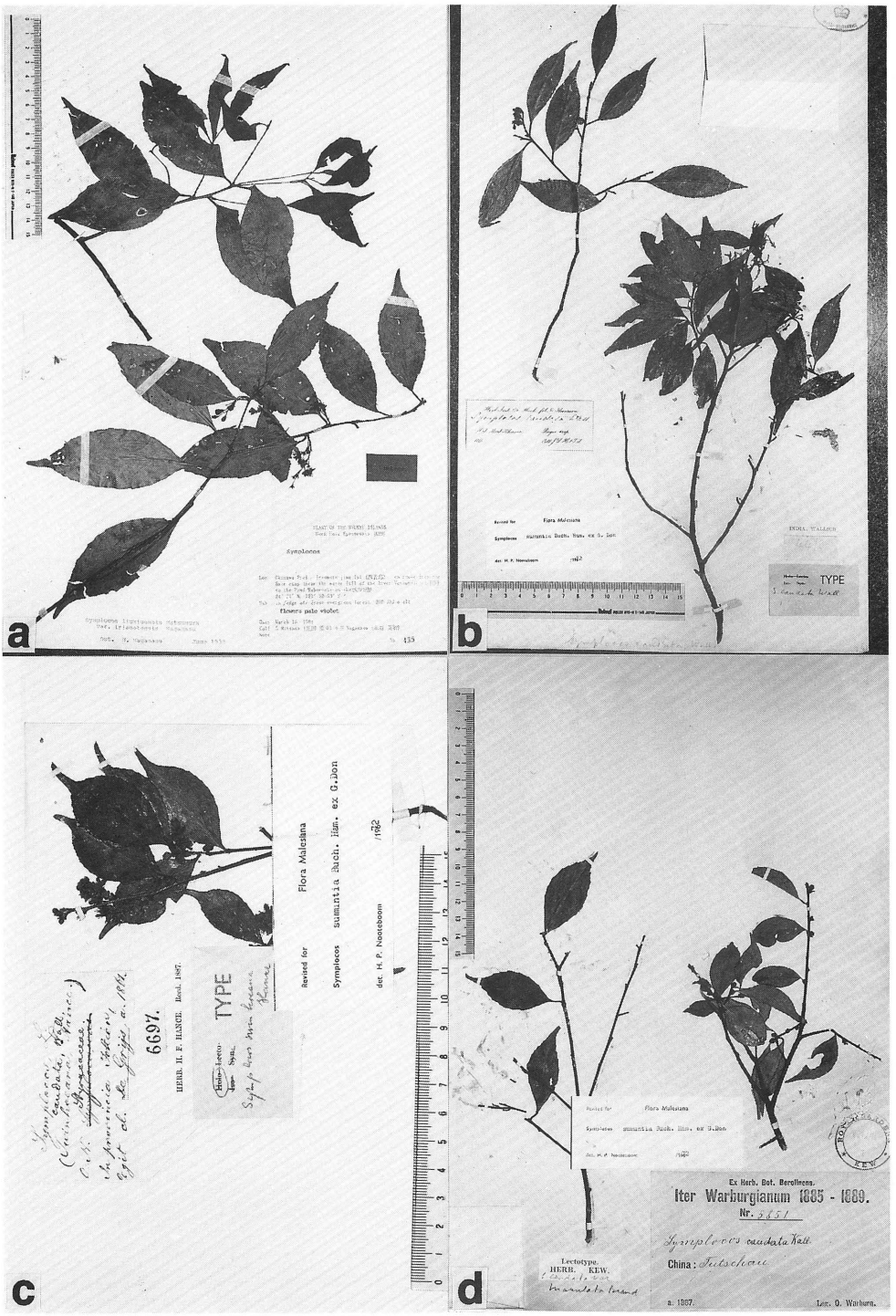
a
b
c
d
TYPE
Flora Malesiana
Revised for
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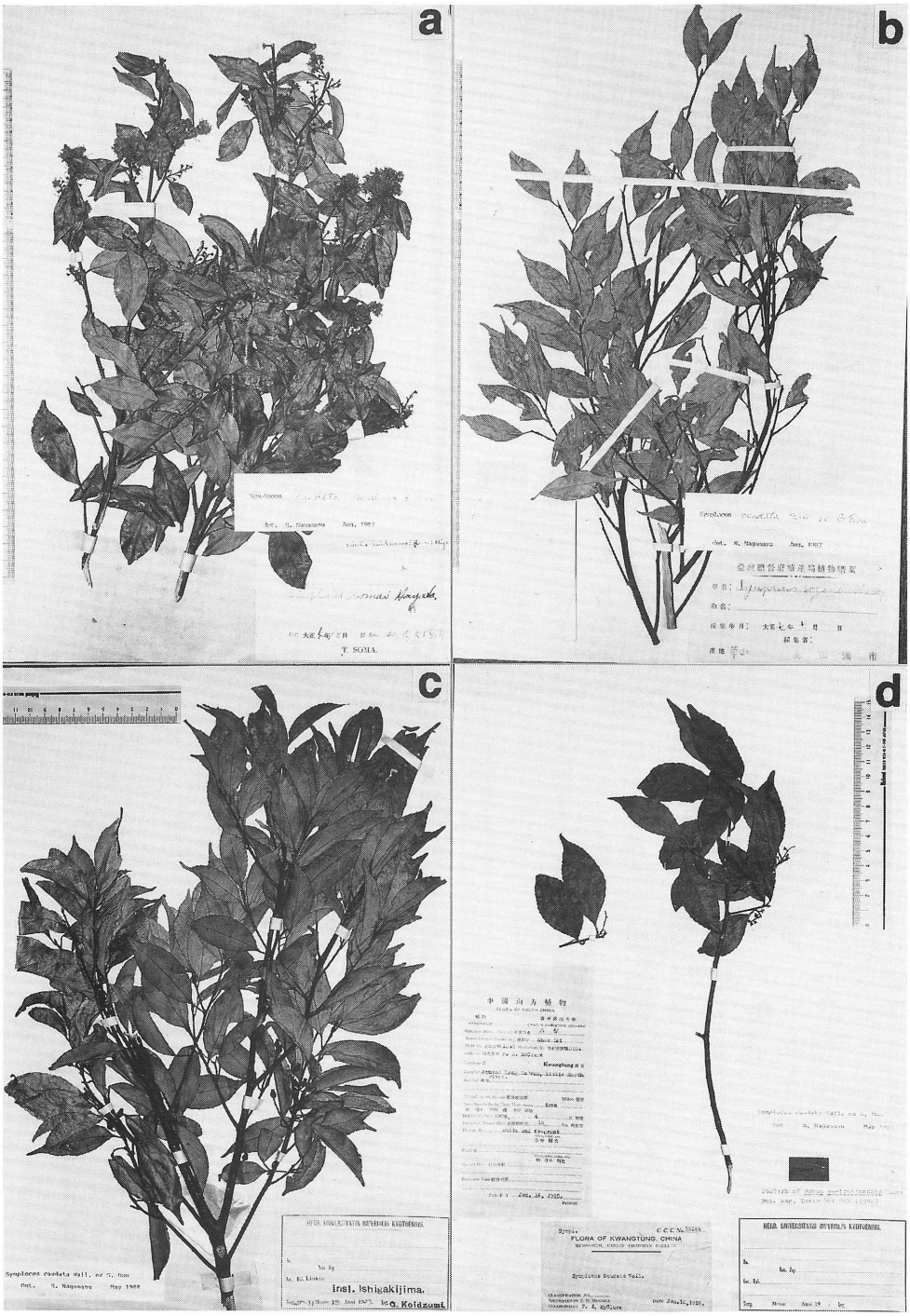
det. H. P. Nooteboom
1982
6697.
HERB. H. F. HANCE. Bord. 1847.
Ex Herb. Bot. Berolinens.
Iter Warburgianum 1885 - 1889.
Nr. 5651
Symplocos caudata Wall.
China: Tschekiang
Lectotype.
HERB. KEW.
Loc. O. Warburg.



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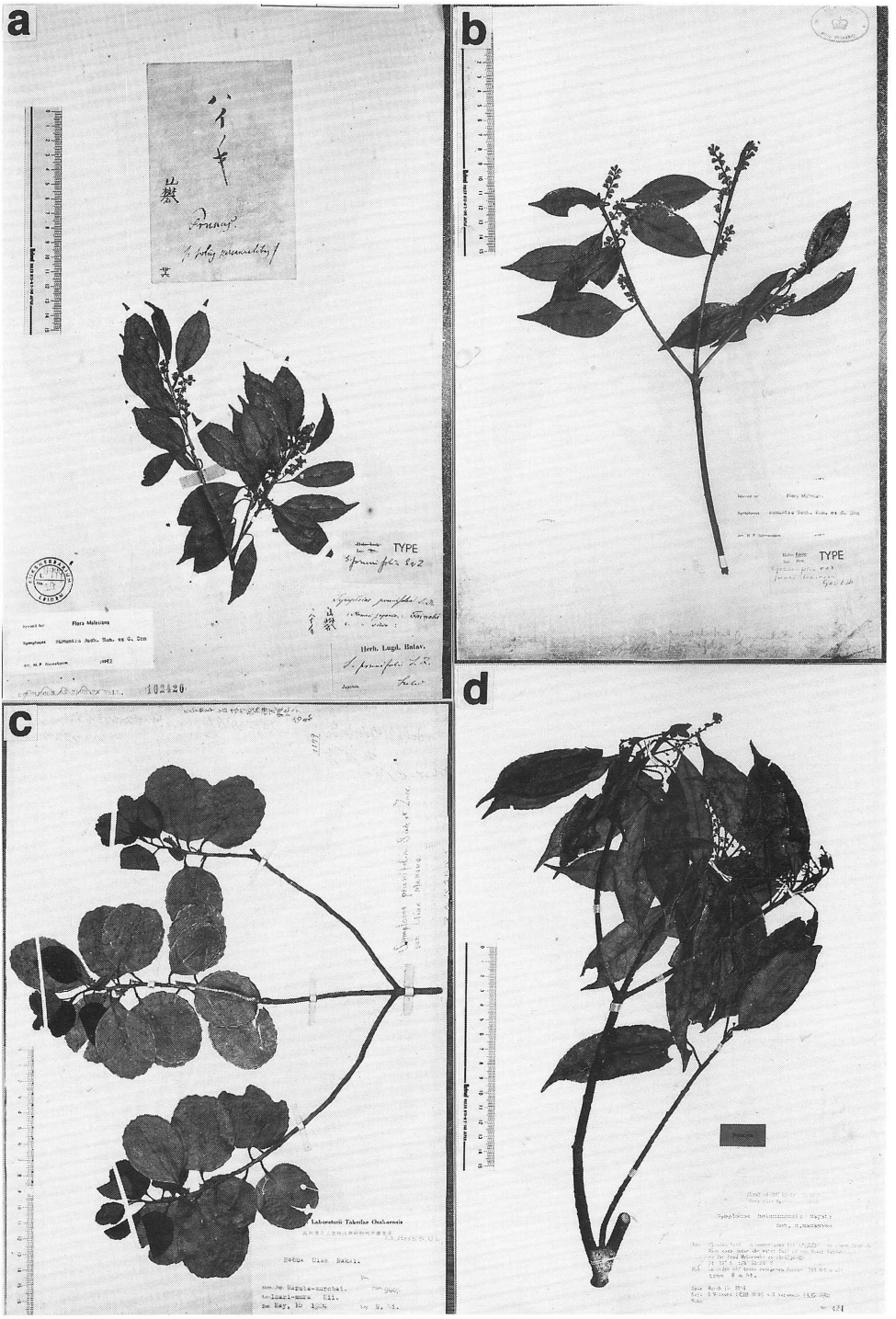

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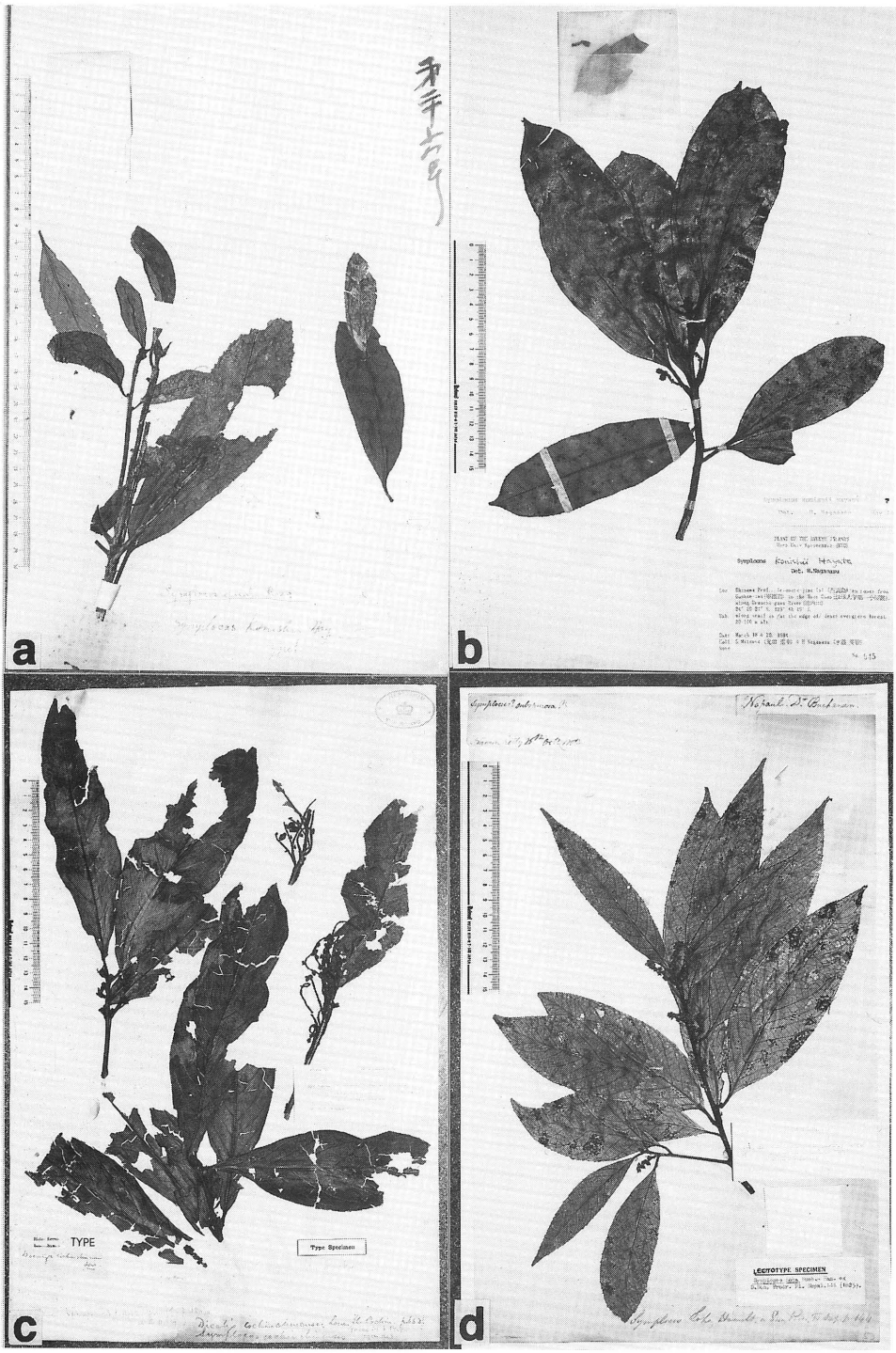

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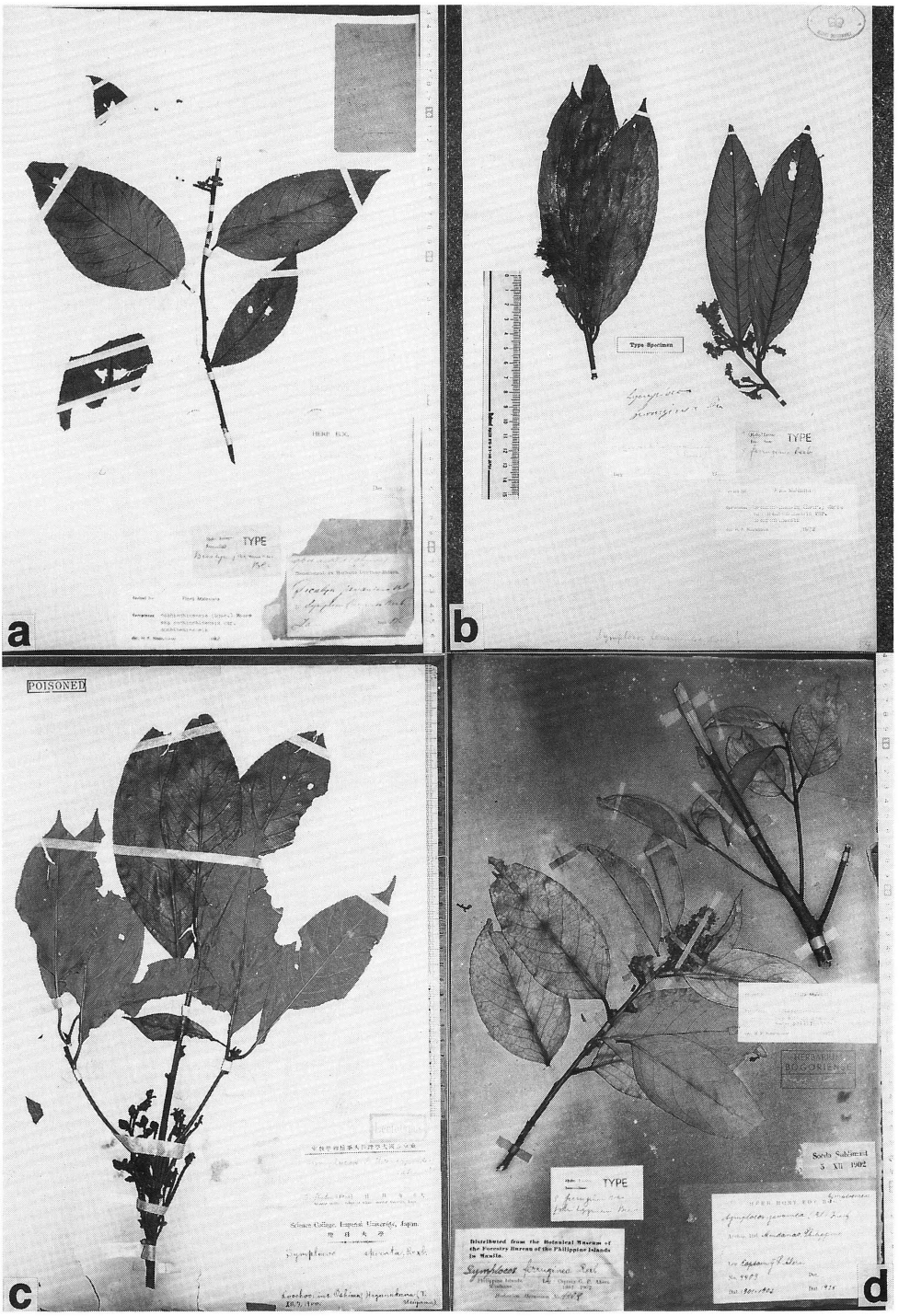

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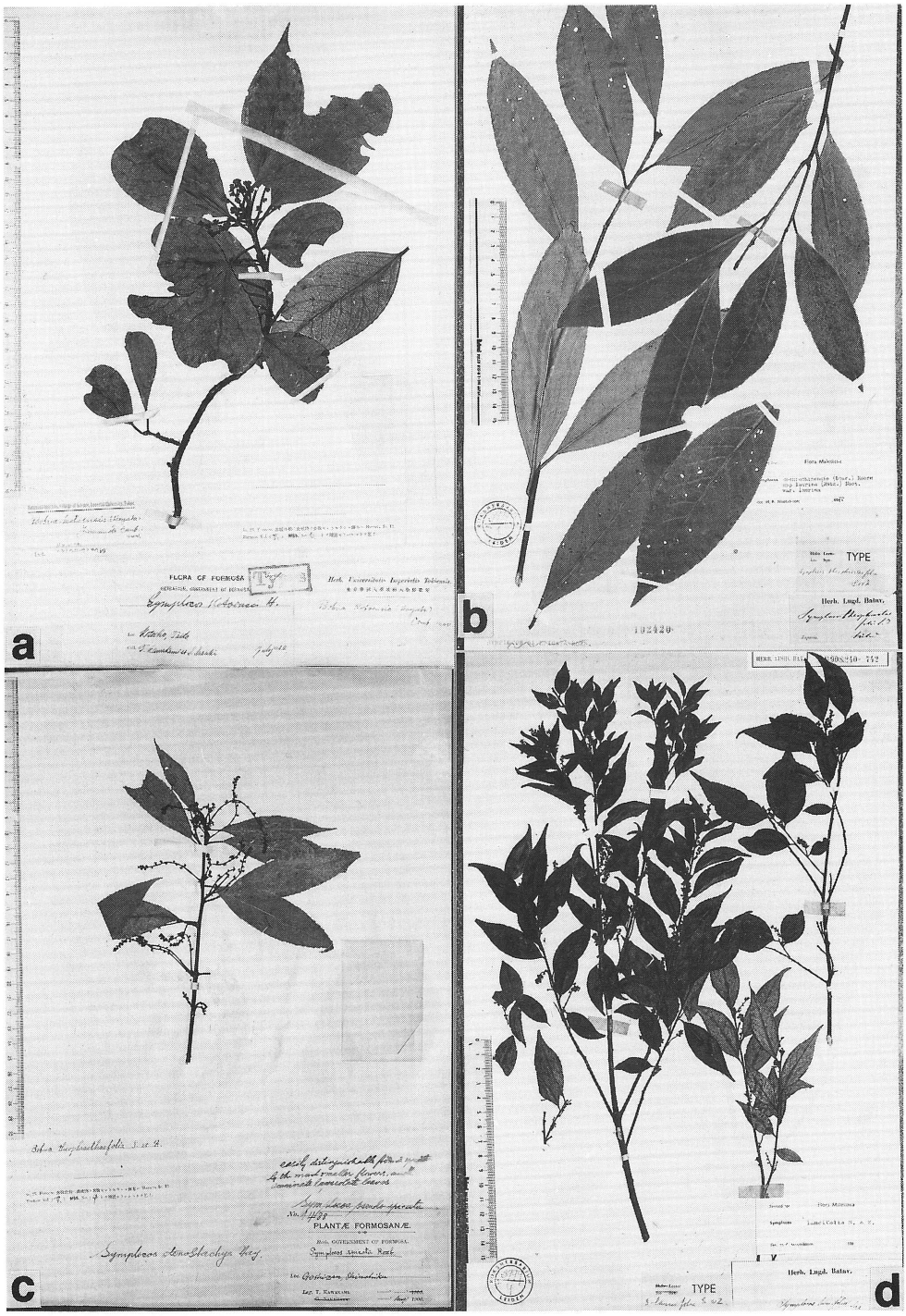

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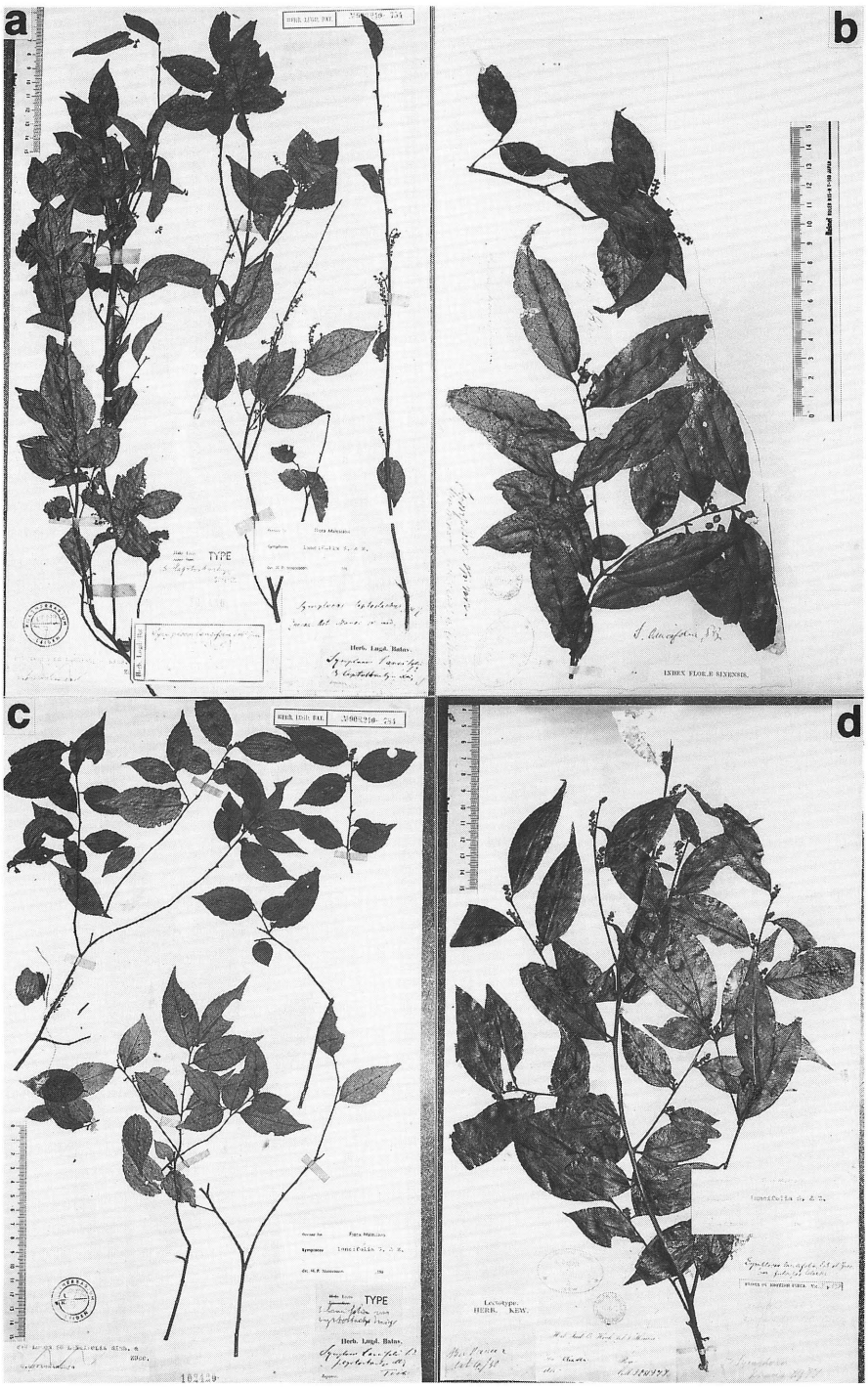

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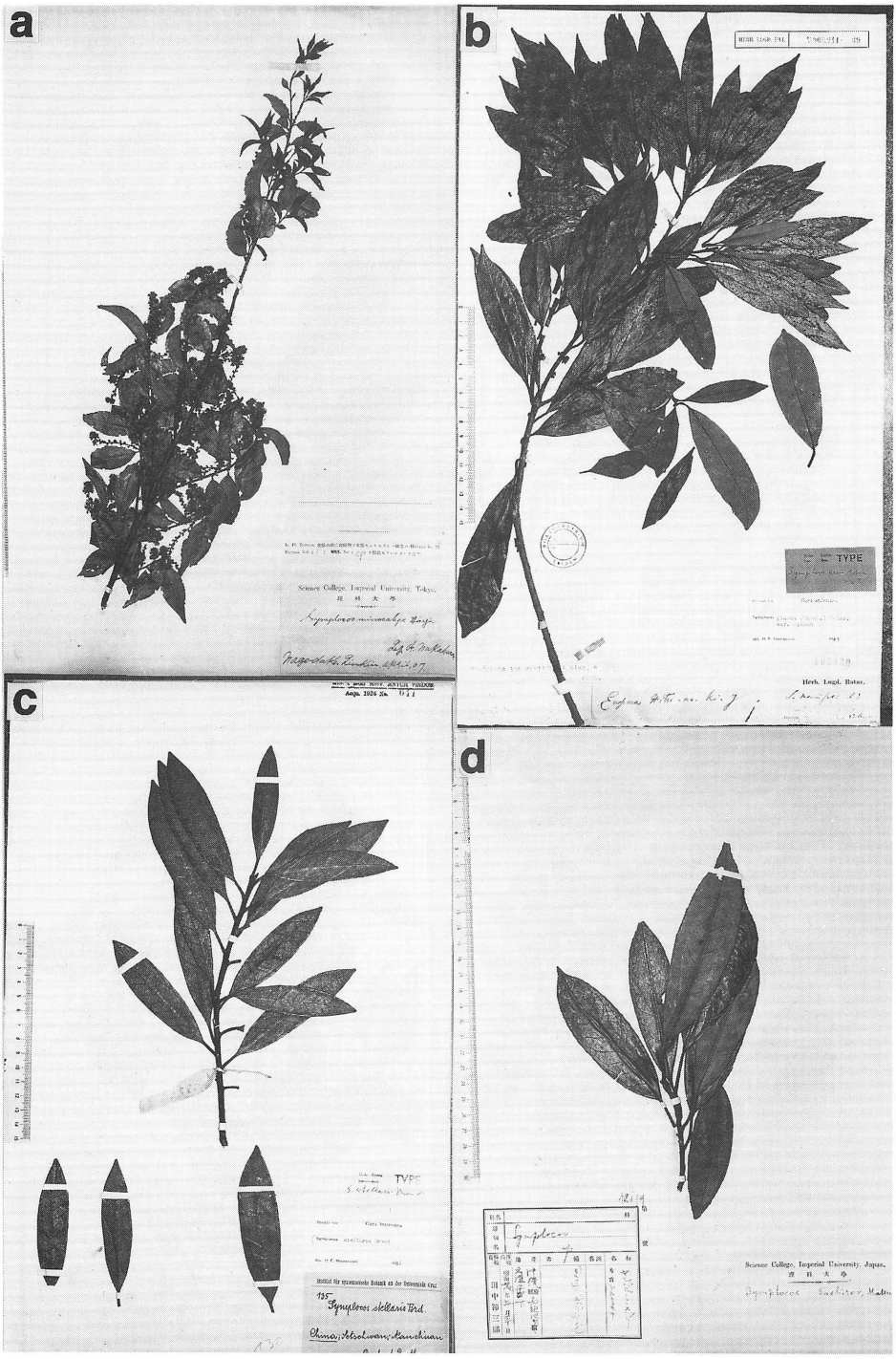
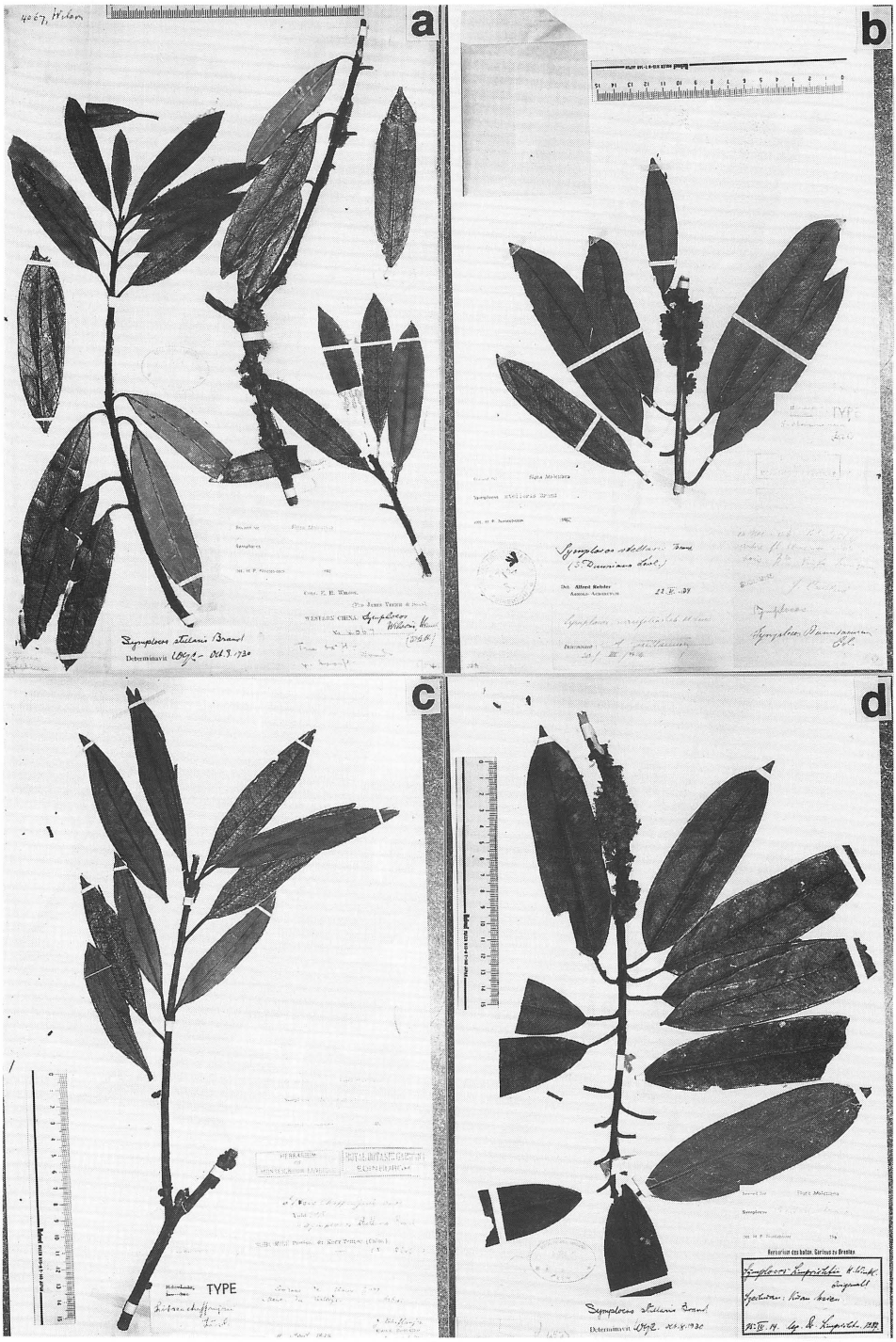
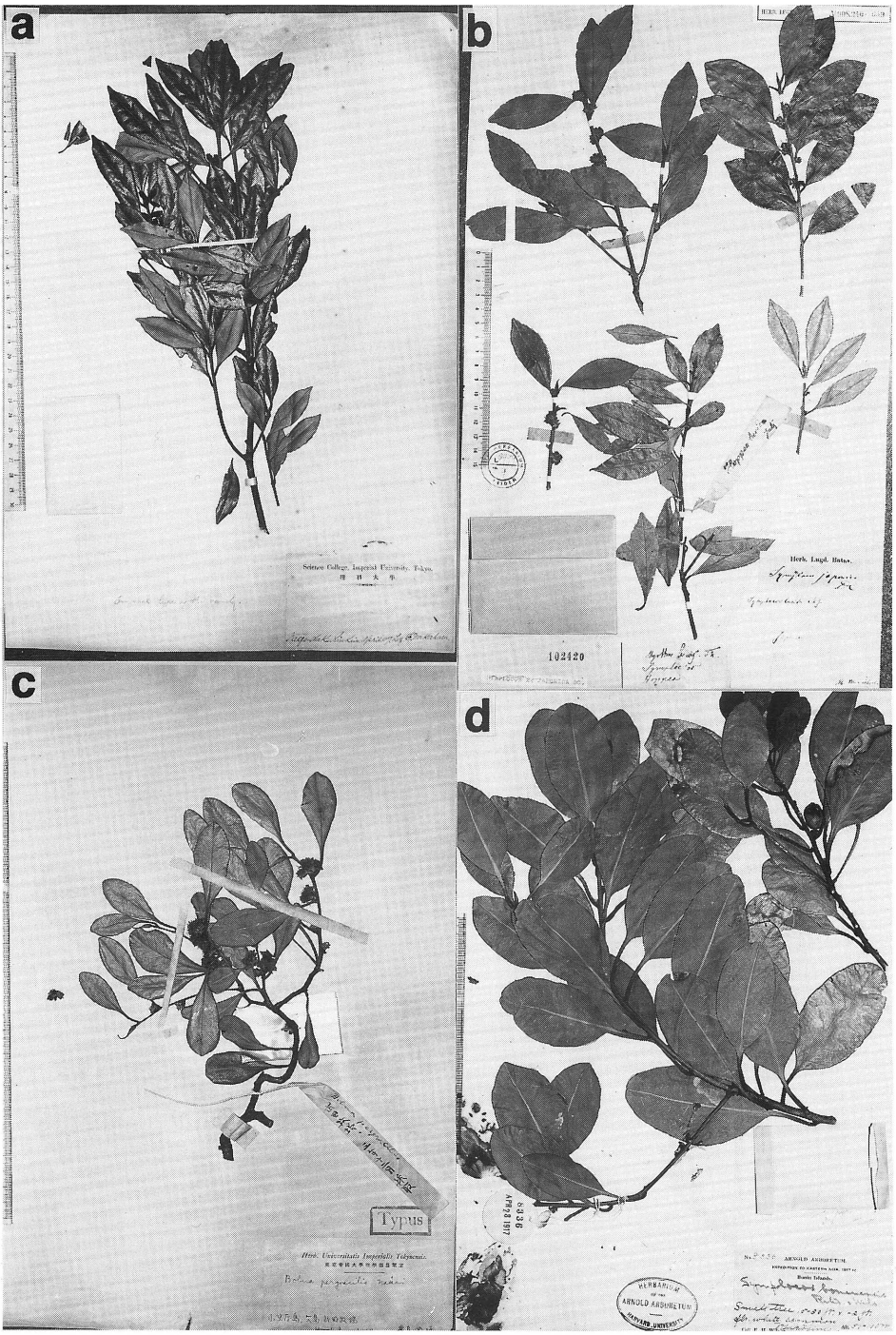


H. NAGAMASU: *Symplocaceae of Japan*



H. NAGAMASU: *Symplocaceae of Japan*



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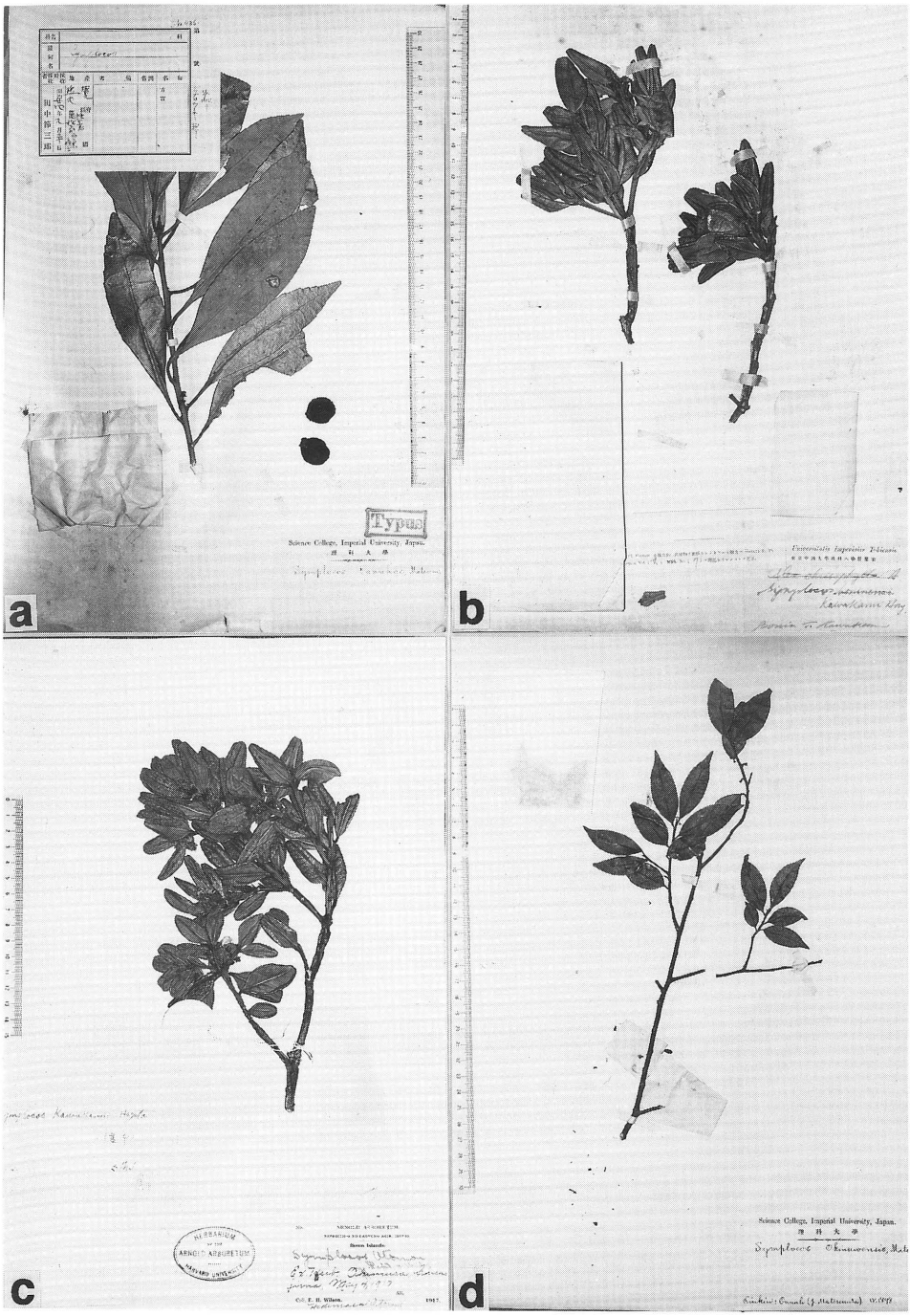

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